Thesis for the Degree of Ph. D.

British Post-War Trade with the British Commonwealth of Nations, especially in its geographical aspects.

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N o t e

In the following pages an attempt has been made to indicate developments of production and commerce within the British Empire during the post-war period, but based principally on the quinquennium 1919-1923. This has been done for the most part by comparison with the pre-war lustrum 1909-1913, and some notice has been taken of the effects of the Great War years in so far as they have altered conditions within the Empire.

Each section is based on official Reports though many authorities have been consulted. To give a complete bibliography would serve no special purpose, but mention must be made of the most admirable "Survey of Overseas Markets" published by the Stationery Office in 1925. No government publication offers such a rich supply of recent material to the economic geographer. From the British Cotton-Growing Corporation I have had much information, always readily and most courteously given. On the other hand, despite an army of workers, the publications of the British Board of Trade lag behind similar papers in all parts of the Empire. Dominion officials in London as in the Dominions themselves have supplied information most willingly. In general I am indebted to a host of kindly correspondents whom I may never meet, but whose assistance I shall never forget. In particular I owe a debt that I can never repay to Dr George G.Chisholm, the former Reader in Edinburgh University, from whom/

whom I learned to love the subject.

Of the difficulties that beset the worker none are so great as those connected with the diversities of statistical records. A uniform system of Colonial Reports is perhaps not desirable, but a somewhat detailed record of the trade of each part of the Empire with the whole would be most useful. In many cases statistics of production refer to exports of the commodity. They are, however, a sufficient guide to trade, and in any case are the only statistics available. Divergences in Imperial Reports have frequently engaged the attention of Governments, and in 1916 the Dominions Commission summarised them for the Dominions and Newfoundland.(1) In the case of the Colonies and Dependencies it is more interesting than instructive to compare one Report with another.(2)

No effort has been made to write a formal geographical account of the Empire. That work has been admirably performed by many writers who have treated the subject regionally and economically. My purpose has been rather to examine, in more detail than is desirable in such books, the progress of Imperial production and the problems connected with the trade of the Empire. Hence only a few typical commodities have been selected for examination, and the accounts of parts of the Empire deal with developmental conditions./

(1) Cd.8156 of 1916.
(2) Compare, for example, the Reports of the Gold Coast (No.1207) and Nigeria (No.1197) for 1923.

conditions.

To have written a detailed account of pre-war Imperial trade would have unduly lengthened my thesis; I have preferred to consider the trade of the post-war Empire from several standpoints which involve consideration of pre-war conditions.

I entered on this research in the certainty that a self-contained British Empire was an economic possibility; my studies, however, have led me to the opposite conclusion. But while I believe that a self-contained Empire is not possible, I am convinced that the economic future of the Empire is assured and hopeful that Imperial trade may increase, though the trade of each Dominion will remain the business of its own people.

"So long as you think of history as a mere chronological narrative, so long you are in the old literary groove which leads to no trustworthy knowledge, but only to that pompous conventional romancing of which all serious men are tired. Break the drowsy spell of narrative; ask yourself questions; set yourself problems; your mind will at once take up a new attitude; you will become an investigator; you will cease to be solemn and begin to be serious. Now modern English history breaks up into two grand problems, the problem of the colonies and the problem of India.....Never did so many vast questions in all parts of the globe, questions calling for all sorts of special knowledge and special training, depend upon the decision of a single public. It must be confessed that this public bears its responsibility lightly! It does not even study colonial and Indian questions. It does not consider them interesting, except in those rare cases when they come to the foreground of politics."

("The Expansion of England" by J.R.Seeley).

INTRODUCTION

Between Britain and the various parts of the British Empire there was, in the pre-war period, a complementary exchange of surplus products. This simple trade relationship by which the Empire fed British workmen and supplied them with the raw materials for their multifarious industries, in exchange for fully manufactured goods, while satisfactory to both parties, was neither the be-all nor the end-all of either. On the one side imperial trade was only a branch of British Overseas commerce; on the other it was not to be expected that self-governin nations of British peoples would remain content in new lands where urban life had established an inevitable growth, to continu the export of raw materials they themselves could manufacture if their home markets were secured; and there was springing up a trade in each Dominion, unfettered by British considerations, with various parts of the Empire and with all nations of the world. This non-British Dominion trade was of benefit to Britain in several ways. Much of it was carried in British ships, the earnings of which are reckoned as invisible exports; the growth of such trade allowed the Dominions to absorb large numbers of British emigrants, to utilise the services of British scientific experts for further development, to employ profitably much of the British capital available for investment abroad, and to purchase still more British industrial products. Thus the pre-war /

pre-war Empire was in practice open to the world's commerce on equal terms, and as such favourably regarded by the Great Powers whose colonies and possessions were preserved for their own trade under various fiscal systems.

During the War period industrial output, migration, mercantile shipping, and world trade were seriously dislocated for Britain and the Empire alike. British industries were largely restricted to the production of war material, with the result that imperial markets were depleted of British manufactures and were forced either to purchase in foreign countries where the effects of the War were little felt, or to manufacture for themselves. Emigration from Britain practically ceased; production of materials and food for the fighting forces was maintained by an industrial army within the Empire, reinforced by the older men, the physically unfit, and patriotic women, or purchased at high prices abroad, especially in the United States and Japan. War stores became the cargoes of the British Mercantile Marine, much of which was absorbed in war activities - the transport of troops, materials, and wounded, the laying of mines, scouting, carrying supplies for the navy, etc. Losses by accident, enemy fire, submarines; diversion of tonnage to the aid of the Allies; and internment in enemy or neutral ports all helped to reduce the number and efficiency of the World's greatest trade fleet. The Empire's share of the services of British cargo-carriers was reduced. For the successful prosecution of the War Britain was forced to restrict her foreign trade /

trade, and Imperial and foreign customers turned to the United States and Japan since industrial Europe had neither opportunity nor means to supply them. These adverse conditions led the Dominions to realise that for their economic preservation they must extend their industrial undertakings, and build up mercantile fleets to carry their merchandise.

Under these circumstances the period following the Armistice was fraught with many difficulties. Factories for the production of War material had to be transformed for the manufacture of commercial wares, and the tangled thread of industrialism had to be unravelled. The beating of swords into ploughshares was a less simple operation than in Biblical times. Britain's manhood was reduced by very heavy war casualties; the numerous war-graves in Flanders, Italy, Gallipoli, Mesopotamia, Palestine, and other theatres were linked with large numbers of permanently or temporarily disabled men. Demobilisation threw upon a labour market thousands of able-bodied artisans, clerks, etc. for whom it had no openings. In the Dominions similar conditions prevailed, and migration to new opportunities was scarcely possible until the Dominions had productively re-absorbed their returned soldiers. A decimated Mercantile Marine required to be re-conditioned and the war losses made good, if British trade was to attempt the recovery of its markets. The Dominions were establishing fleets of their own when the world's idle tonnage was deteriorating in its harbours. Each belligerent country had to set its affairs in order before it sought again the /

the re-establishment of its foreign trade. Nevertheless the years 1919 and 1920 were marked by trade prosperity within the Empire, and people thought it would continue indefinitely. On the contrary it proved to be short-lived, and the reaction of depression brought with it a state of national pessimism. It is doubtful it even by 1926 a post-war normality has been attained, and, while the account of the post-War Empire that has been attempted in the following pages gives a summary outline of development and trade, it can hardly do more than suggest the trend of affairs following the titanic upheaval from which the world has emerged shaken, disorganised, doubtful, and suspicious.

For Britain there are two great problems the solutions of which may be inter-related if not inter-dependent. One is the restoration of her foreign trade and especially of her domestic exports. It is two-sided, involving on the one hand the recovery of her foreign coal markets in order to reduce freight charges for inward cargoes; ~~the~~ on the other hand the recapture of markets for her manufactured goods, - exports by means of which in part she can pay for imported food and raw materials. The second problem is concerned with her surplus population, for her deplorable loss of man power in the War has been partly balanced by natural increase and reduced emigration, and the population of Great Britain at the census of 1921 showed an increase of two millions over that of 1911. This growth of numbers is aggravated by reduced national production, while in some industries the efficiency of the latest machinery means that /

that fewer operatives are required, and there appears little doubt that the coal-mines, and perhaps also the cotton mills, are over-manned. Industrial disputes have the double result of throwing still more workers out of employment, while the consequent taxation for their maintenance and the loss of trade reduce the ability of employers to utilise their labour afterwards. Trade recovery must mean greater employment at home, but it must also imply greater opportunities in the countries with which trade is carried on.

British trade is suffering most severely on the export side, and most seriously in the decline of exports of fully manufactured goods. This is due to the increasingly acute competition of such foreign countries as the United States, Germany, Czechoslovakia, and Japan, to the protectionist encouragement of manufacturing industries in the British Dominions, especially in Canada and Australia, and to the reduced purchases, partly due to economic, partly to political causes, of India within the Empire, and of China without the Empire. British export trade must be stimulated in markets which can offer the return of foodstuffs and raw materials, and such markets are to be found most readily in the lands of the Empire. From this point of view the "Buy Empire Goods" policy is a praiseworthy attempt to give Dominion produce some advantage over foreign commodities. This policy is a belated outcome of the Imperial Conference of 1917 which decided that "the time has arrived when all possible encouragement should be given to the development of /

of Imperial resources, and especially to make the Empire independent of other countries in respect of food supplies, raw materials, and essential industries."

In the following pages a table shows that Empire peoples are the largest per caput purchasers of British exports, and thus any increase of the number of inhabitants in these Imperial countries would be likely to mean increased exports from the United Kingdom. There can be no doubt that British trade within the Empire is capable of great development, that this trade development must be prepared for by more extensive development of Imperial resources (which are undeniably rich), that to secure fuller Imperial production the Dominions require to be more densely peopled, and that there is ample space and opportunity for millions of settlers in the self-governing Dominions.

In these two great respects, then, the United Kingdom and the great self-governing Dominions are complementary - British manufactured goods may be exchanged for Imperial foodstuffs and raw materials; over-populated Britain can people the sparsely-populated Dominions.

Some indication of the trade of the Dominions is given later; meanwhile it may be worth while to examine some commodities of British trade that have long been regarded as of predominant importance. Among exports of British produce articles wholly or mainly manufactured comprise about 75 per cent. of the value. Of such articles, cotton, woollen and worsted yarns and manufactures, iron and steel and manufactures thereof, machinery /

machinery, vehicles, electrical goods and apparatus, cutlery, hardware implements, and instruments accounted for 70 per cent. by value in 1923.

Cotton yarns and manufactures are the largest group of British exports, representing in 1923 30 per cent. of the value of the exported commodities specified above. Cotton yarns are exported mainly to the continent of Europe, the only part of the Empire buying largely being British India. The quantity exported has declined from 210.1 million lbs. in 1913 to 163.1 millions in 1924. Such a decrease shows the post-war instability of European markets.

Cotton piece-goods, which comprise 20 per cent. of the total value of all British exports, show also a serious set-back in the post-war period. Compared with 7,075.3 million yards in 1913, 4,636.7 million yards in 1925 is a serious decrease, representing diminished buying capacity especially in India, which purchased over one-third of the quantity exported in 1923. In the accompanying table (1) the distribution of cotton piece-goods for 1913 and 1925 indicates that the largest pre-war markets (the Far East including India) are those which show the decline, - 61.7 to 42.1 per cent.

Export /

(1) The Board of Trade Journal, Oct. 21, 1926.

Export of Cotton Piece Goods - All Kinds

Markets	1913	1925
India	43.2	28.9
Australia & New Zealand	3.0	4.4
United States & Canada	2.2	2.9
Far East (excluding India)	18.5	13.2
Europe	5.5	12.0
Balkans, Near & Middle East	6.8	9.4
Central & South America	10.6	12.8
North Africa	5.1	7.7
West Africa	3.4	6.2
South and East Africa	1.7	2.5
	100.0	100.0
Average price per yard	3.3d	7.8d

In the Far Eastern markets the shrinkage of demand in the post-war period has been common to all sections. Some account of the Indian trade is given later; in China the internal disorders, in Japan the great earthquake, help to explain the fall in imports. In all three countries production of cotton goods has greatly increased. In the Near East, markets have been affected by political disorders following the War.

Exports /

Exports of British Cotton Goods to British Empire 1923

	Yarn in Million lbs.	Piece goods in million square yards				
		Gray unbleached	White bleached	Printed	Dyed and Coloured	Total Piece Goods
British India	20.2	689.9	411.5	153.3	109.6	1,364.4
Straits Settlts	.4	15.4	33.1	14.3	14.9	77.6
Brit. W. Africa	-	7.0	31.9	34.1	33.0	106.0
Brit. S. Africa		4.5	21.0	17.7	31.6	74.7
Iraq	-	.7	34.0	38.9	24.2	97.8
Australia	-	22.6	52.1	21.3	75.2	171.2
Canada	1.7	6.7	13.0	15.0	19.6	54.3
Grand Total	145.0	1300.9	1276.9	632.8	929.7	4,140.2
Brit.Emp. %	19.3	60.2	54.2	53.4	42.0	53.1

Woollen yarn and manufactures, with a market climatically different from that for cottons, accounted for less than 10 per cent. by value of exports of British produce in the period 1919-23. Of the two principal groups - woollen and worsted tissues - the Empire purchased 34.7 per cent. by quantity in 1923 when 211.5 million square yards were exported.(1) The largest imperial customers were Canada (13.6 per cent. by quantity), Australia (8.7), British East Indies (2.3), and New Zealand (2.3). For woollen goods the world purchasers are mainly the white races, although Japan and China also buy largely. Hence prices do not have so far-reaching an effect as in the cotton trade. Raw wool and raw cotton alike rose rapidly in price owing to shortage of supplies.

Iron and steel and manufactures thereof, which made up 10.1 per cent. by value of British exports in 1909-13, accounted for only 9.1 per cent. in 1919-23; by weight the corresponding /

(1) 168.4 million yards in 1913.

corresponding figures were 4.6 million tons and 3.0 million tons. Machinery exports showed a similar decline both by percentage (6.4 to 6.1) and by weight (0.6 to 0.4 million tons). Whether the iron and steel industry is regarded from the point of view of production, exports, imports, prices, or the ratio of actual output to capacity, the picture is a gloomy one. This may best be indicated by a comparison of 1913 with 1924.[1]

British Iron and Steel Industry

	1913	1924
Furnaces in blast	338	185
Pig iron produced (million tons)	10.3	7.3
Steel output (" ")	7.7	8.2
Exports (" ")	5.0	3.9
Imports (" ")	2.2	2.4
Price of Pig iron per ton (Cleveland)[2]	50s. 6d	81s. 6d
" " Steel rails " " (Middlesbrough)[2]	120s.	180s.
" " Iron Bars " " (Middlesbrough)	150s.	240s.

The small increase in the output of steel is accounted for by the war-time expansion of the industry; the increase in imports is the result of continental competition. But perhaps the great cause (leaving out of account local factors such as coal and labour difficulties) underlying the apparently persisting depression in this industry, is the decline in the world's consumption. Here again, the War has brought about economic results that have proved disastrous to world consumption, though, of course, when world conditions improve, demand will improve, and it /

(1) The Economist, Feb. 14 and April 11, 1925.
(2) Price at end of year.

it is not without hope that British manufacturers look ahead.

Export of Certain Iron and Steel Goods to the Empire, 1923

	Bars, Rods,[1] Angles, etc.		Plates and Sheets				Railway, etc. Material	Machinery		
	Iron	Steel	A[2]	B[2]	Galvanised	Tinned	Steel Rails	Agricultural	Textile	All kinds
	Figures are Thousands of Tons									
W.Africa	-	-	-	-	-	-	22.3	-	-	3.6
S.Africa	3.8	11.3	-	-	34.9	-	32.9	2.6	-	20.3
E.Indies	4.5	45.3	16.2	55.8	147.9	58.9	82.3	.5	57.1	123.5
on	-	3.0	-	-	6.1	-	3.1	-	-	2.3
ralia	8.7	86.5	11.1	32.0	112.2	42.4	27.1	1.3	4.5	31.7
Zealand	8.5	17.8	2.2	4.0	21.7	-	16.8	.5	-	8.8
da	2.7	16.6	5.2	-	7.3	27.2	-	-	-	9.9
d Total	43.6	337.2	283.0	192.5	602.4	551.1	287.5	13.2	138.6	432.6
Emp. %	81.4	59.0	15.7	60.9	61.9	27.7	74.1	47.0	47.0	52.6

[1] Bars, Rods, Angles, Shapes, and Sections, other than of special steel

[2] Plates and Sheets - A. Plates and Black Sheets under $\frac{1}{8}$-inch thick (other than Black Plates). B. All other Plates and Sheets not under $\frac{1}{8}$-inch thick.

Even so brief an examination of British post-war trade in vital exports indicates the serious position of exports of manufactured goods, and shows the necessity for making greater efforts than ever before to hold the markets which purchase now, to endeavour to secure a larger share in them, and to seek new outlets for industrial products.

It is desirable, in view of the interest exhibited at present in Empire trade, to take stock of Imperial resources and potentialities, and, since detailed examination of all commodities would /

would involve immense labour, a selection has been made. The complementary nature of Imperial trade has been borne in mind, and attention has been concentrated in the first place on foodstuffs and raw materials of which wheat, meat, tea, coffee, cocoa, wool, and cotton are typical. In the second place consideration of the Empire's coal deposits and trade has some bearing on British coal exports which have declined so seriously.[1] There follows an economic conspectus of the Dominions, India, and the principal colonies, etc. in which the direction of trade is examined and some consideration of post-war developments attempted. In each section statistics, mainly official, are given as a standard of measurement. While no one would claim that these are unimpeachable they serve to indicate where advance has been made.

Finally, in the concluding section, attention is mainly directed to the avowed attempt by Britain to bring about closer trade relations with the Dominions by favouring their products, and so attain a self-contained Empire. "The fascinating ideal of a self-sufficing Empire is again appealing to the minds of citizens, and it is to be hoped that in striving to ensure a nearer approach to that ideal they will not neglect the valuable guidance that is to be drawn from a study of the story of the old Empire, the real advantages that then accrued both of Colonies and mother country from the pursuit of a similar ideal as well as the very grave /

(1) From 97.7 million tons (including 21.0 million tons for ships' bunkers) in 1913 to 67.2 million tons (bunkers 16.4) in 1925.

grave dangers that it also brought in its train."(1)

On the other hand the evidence adduced does not support the ideal of a self-contained Empire, however desirable it may be, but points rather to the growth of new independent nations of English-speaking peoples, British by race and British in sentiment, but excelling the parent stock in independence of thought and action as in virility - peoples to whose hearts Britain may be dear, but to whose aspirations the British Empire is merely a sentimental fancy.

(1) "The Old Empire and the New" - A. P. Newton, p. 91.

W H E A T

Perhaps no figures of World Production are so interesting or important to the British public (which concerns itself very little about them)[1] as those of Wheat Crops. The custom of securing our daily bread with regularity has staled the infinite variety of statistics regarding cources of supply, and this despite the fact that home production yields but a fraction of our needs.

The World's Wheat Crops[2] Table 1

	AREA				PRODUCTION				YIELD PER ACRE	
	million acres		per cent. of total		million centals		per cent. of total.		centals	
	1909-13	1919-23	1909-13	1919-23	1909-13	1919-23	1909-13	1919-23	1909-13	1919-23
rope	71.6	61.2	37.5	28.7	809.3	646.1	45.7	35.4	11.3	10.6
rth America	57.0	88.0	29.9	41.3	532.4	716.5	30.1	39.2	9.4	8.2
ia	31.0	30.0	16.2	14.1	230.2	220.7	13.0	12.1	7.4	7.3
gentine	16.1	16.0	8.4	7.5	88.2	120.9	5.0	6.6	5.5	7.5
rth Africa	7.7	8.1	4.0	3.8	56.4	50.9	3.2	2.8	7.3	6.3
ion of S.Africa	-	0.9	-	0.4	-	4.1	-	0.2	-	4.6
stralia	7.6	8.9	4.0	4.2	54.2	66.6	3.0	3.7	7.1	~~8.6~~ 7.5
Total	191.1	213.1	100.0	100.0	1770.7	1825.8	100.0	100.0	9.3	8.6

(1) "Do we really see, as the central fact of our national existence, that we are dependent om countries overseas for the means of life? [Our supplies of food] are bought, against the competition of other nations, by ~~xxxxx~~ the boldness of our enterprise, the diligence of our labour, and the soundness of our financial strength." ("Declension" by A Gentleman with a Duster.)

(2) Figures from Report of International Institute of Agriculture, Rome. Jan. 1925 and Jan. 1926 (The figures are for certain countries only).

1909-13

SOURCES OF
BRITISH WHEAT AND FLOUR IMPORTS.
(FLOUR IN EQUIVALENT WEIGHT OF WHEAT GRAIN)
1919-23

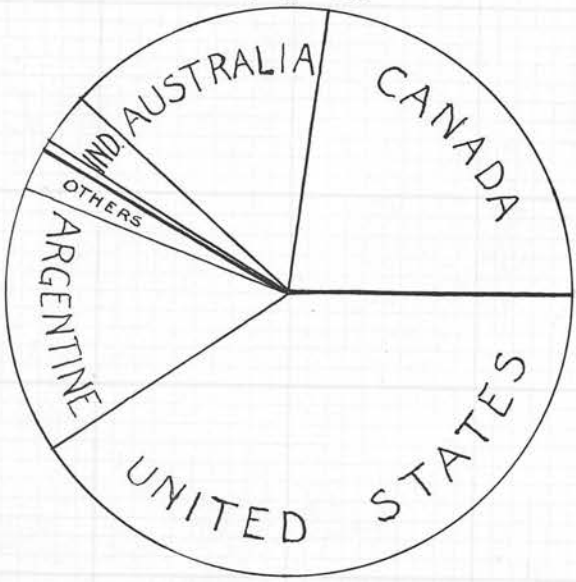


Fig. 71

During the fifteen years that have elapsed since 1908 the approximate total import of wheat into Great Britain has been 1,688 millions of hundredweights. Divided into five-yearly periods among the principal sources of supply (1) and with the contributions of each exporting country shown as a percentage of the total for each quinquennium the imports are as follow -

Table 2

	QUINQUENNIA		
	1909-13	1914-18	1919-23
Average Annual Total Import (Grain and Flour) in equivalent weight of Grain) millions of cwt.	118.1	108.2	111.3
Percentage share of -			
United States(2)	22	52	41
Canada	19	25	23
Australia	11	6	16
Argentine	14	8	15
India	16	6	3
Russia	13	2	-
British Empire	48	37	41

Thus practically the whole of our imported wheat supply is /

(1) The sources specified in Table ~~17~~ 2 contributed almost 98 per cent of the total imports 1909-1923.

(2) United States Wheat (a)

	Production (million bush.)	Yield per acre (bush)	Exports (per cent)	Imports (m.bush)	Home consumption (million bush)
1909-13	645.8	14.0	14.7	1.4	478.8
1914-18	766.2	14.6	26.8	12.9	510.8
1919-23	853.8	12.9	31.6	21.6	501.1

(a) average annual figures based on the "Statistical Abstract of the United States," expressed as Imperial bushels.

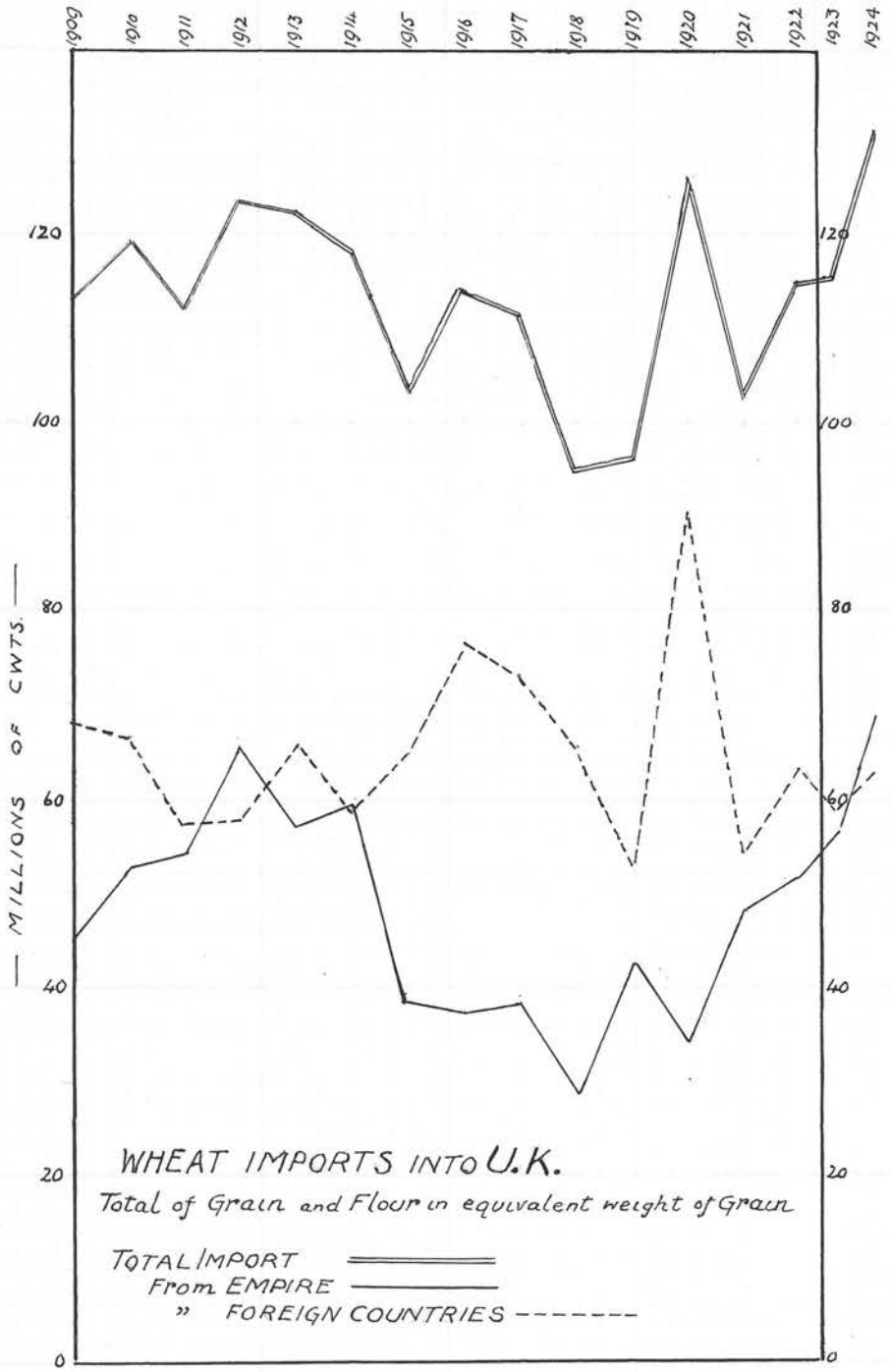

1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
120
100
80
60
40
20
0
— MILLIONS OF CWTS. —
WHEAT IMPORTS INTO U.K.
Total of Grain and Flour in equivalent weight of Grain
TOTAL IMPORT
From EMPIRE
" FOREIGN COUNTRIES

Fig. 2

is derived from six cultivating lands the exports of each of which vary from period to period and even from season to season. Such fluctuations depend upon a number of varying factors which will be discussed in the examination of cultivation in each contributing part of the Empire.

Meanwhile it is important to note in how large a degree Great Britain is dependent upon such imports. Practically all our imports of Wheat (1) are retained for home consumption, and if we add to these the figures for the crops of Great Britain we get a rough idea of the total consumption of wheat in the country. The result may be tabulated as follows -

Table 3

	1909-13	1914-18	1919-23
	Annual Average Millions of Cwt.		
Total U.K. crop	32.0	37.9	34.7
Export of U.K. crop	1.5	1.0	1.6
Available for U.K. consumption	30.5	36.9	33.1
Imports of wheat grain, meal and flour	118.1	108.2	111.3
(Percentage of wheat meal & flour)	(9)	(13)	(13)
Re-exports	0.5	0.5	1.0
Available for U.K. consumption	117.6	107.7	110.3
Total available for U.K. consumption	148.1	144.6	143.4
Percentage of above imported	79	74	77
Consuming Population (millions)	45.5 (2)		47.3 (3)

This table brings out several points worthy of attention.

British /

(1) 99 per cent for the period 1909-23.
(2) Census 1911.
(3) Census 1921 (for Ireland 1911 thus including the Irish Free State)

British Wheat production was a steadily declining industry by 1913. During the war great efforts had to be made in view of the German submarine activity, - a campaign that "might, perhaps, never have started had not Germany been convinced that British agriculture was so enfeebled that it could not, to any serious extent, increase production," (1) and assured that imports could be dangerously reduced. (2) In 1913 the area under wheat in the United Kingdom was 1.8 million acres, by an uneconomic policy of government regulation this acreage was increased to a maximum of 2.8 millions in 1918 - the crop of 87.5 million bushels showing an increase of close upon 60 per cent over that of 1913, and still yielding 33.2 bushels per acre against 31.5 in 1913. (3) With the advent of peace the acreage is again diminishing It appears evident that neither the lessons of the war, nor /

(1) "The Land and the Nation" p.7 "The Land and Its People" (Lord Ernle) p.102 et seq.

(2) "The absolute minimum of tonnage necessary to victory, 26,500,000 was barely covered by the amount available on May 1, 1917. There was a margin of but 500,000 tons, and the average monthly losses were 640,000 tons. It appeared as though the German estimate..... of the certain defeat of the Allies within two months was a reasonable, not to say moderate one." (Rear-Admiral W.S. Sims in "These Eventful Years" p.371).

(3) In 1924 it was 1.6 millions (excluding Ireland).

nor any agricultural policy of the Government, can impress the seriousness of the British decline in cultivating power on an industrial and apathetic nation.(1)

Even in the statistics of imports, which show that we have not yet reached the pre-war average, the increasing proportion of milled grain entering the country means a loss to British millers and to the nation; taken together decreased imports and increased meal and flour indicate the seriousness of the transport and coal problems.

Above all, the high percentage of imported to home-grown grain is an arresting fact that should "give us pause" - out of every five loaves we consume, four are baked from imported grain and flour!

From a consideration of the graph of imports (fig. 7) it is evident that Britain is becoming more and more dependent upon a few countries for her supplies - a disquieting factor when we remember the danger of our reliance on the United States for cotton. The Empire does not yet contribute half of our total imports,(2) and it is to Canada alone, where, however, the value of rotation and of fertilisers is scarcely realised, that we may look to redress the balance; Australia is cursed with /

(1) "Our countryside, it may be said, is the backyard of our industrialism or the suburban garden of our imperial grandeur... "We have sacrificed our agriculture to our industries, and the more our population has increased the more hardly have we borne upon the farmer, until at the present moment his position is little better than that of a man living on the dole."
("Declension" by A Gentleman with a Duster, pp. 15-16).

(2) In 1912, 1914, and 1924 the Empire supplies over 50 per cent. of our total imports (Fig. 2).

with lands on the margin of ~~rainfa~~ adequate rainfall, worked by dear labour, and far removed from the British market. India is consuming more and more of her crops which are roughly constant in quantity; New Zealand, with a small population, is avowedly restricting her crop to her own requirements.

It must be noted, however, that the United States competed increasingly with the United Kingdom for supplies of Canadian wheat till 1923, in the sense that that Republic was purchasing more largely than ever in Canadian markets. In 1924 and 1925 United States' purchases were much smaller.

Table 4

EXPORTS OF CANADIAN WHEAT

	To United Kingdom by quantity	To United States by quantity	Average Annual Export	Percentage of Total Crop Exported.
	Per cent	Per cent	Million bush.	Per cent
1909-13	90.7	4.5	60.5	32.8
1914-18	85.3	8.9	138.0	55.2
1919-23	62.8	14.0	120.1	36.8
1925	74.6	2.8	191.8	

Table 5

EMPIRE PRODUCTION OF WHEAT

	1909-13 1000 Bushels	1919-23 1000 Bushels
United Kingdom	59,640	63,123
India	357,276	329,571
Canada	184,272	326,259
Australia	90,497	104,446
New Zealand	6,925	6,913
Union of South Africa	5,431 (f)	6,418
TOTALS	719,883	837,924

(f) figures for 1911 only.

Climatic control of Wheat-Growing within the British Empire.

Within the British Empire, as over the world at large, there are two main types of wheat-growing lands, - the Cool Temperate, in which the seed is sown generally in spring (though in parts favoured with a mild winter sowing may take place in autumn) and the plant grows through the hot, wet summer to be harvested in autumn; and the Warm Temperate or "Mediterranean" where sowing is carried out in autumn (but sometimes in spring), and the plant, fed by winter and spring rains and moderate but increasing temperatures, ripens to be cut before the hottest part of the summer.

So far as sowing is concerned it may be noted that wheat seed will not germinate unless the mean air temperature of spring is over 40°F., and that germination occurs more rapidly as the temperature reaches 80°F, but that beyond that optimum the rate diminishes until, if the temperature is much over 100°F, the seed dies. Similarly frost kills the plant, and cutting must not be delayed after the mean autumn temperature has fallen to about 50°F. when ripening ceases.

Within this scientific period, which of course affects principally the polar or altitude limits of the wheat belts, the accumulated temperatures over 41°F. for the period between sowing and harvest are calculated, and an estimate formed of the possible extension /

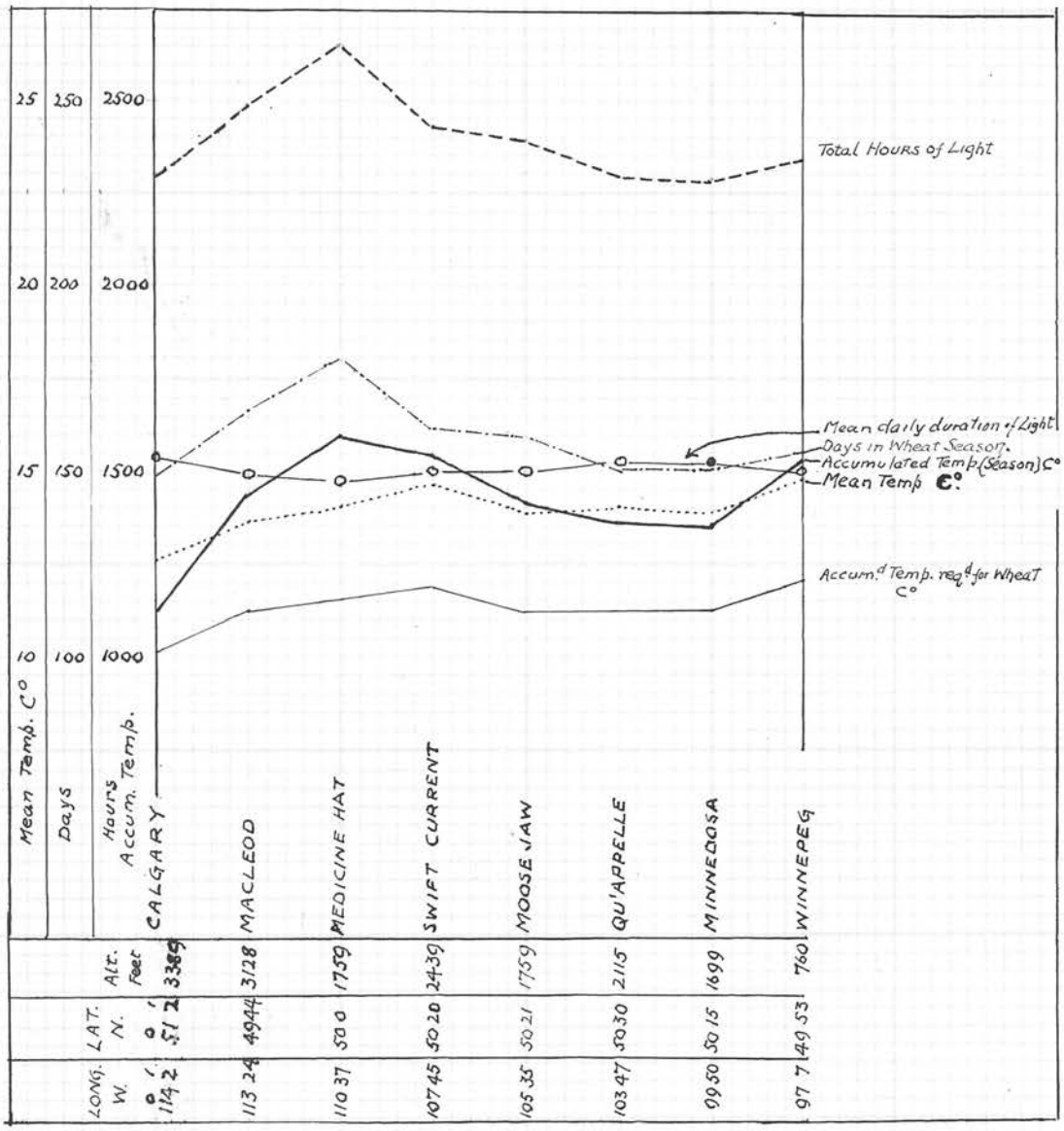
extension of the crop so far as heat is concerned.(1)

With such accumulated temperatures the total and mean daily duration of light must be considered along with altitude in order to determine even approximately the requirements for wheat, but with these are inextricably bound considerations of precipitation.

Such considerations are by no means simple. Hence though the minimum requirement of the plant in an arid region may be equivalent to 4 or 5 inches of rain the precipitation necessary in order to allow for evaporation, percolation and drainage, must be very much greater. On the other hand, in such dry areas especially, "the plant utilises from the ground very often more moisture than it receives from the rainfall."(2) Again much depends on the nature of the soil, especially with regard to the balance between gravity and capillarity in water content, and on the variety of wheat to be cultivated.(3) A general study of average annual, or even seasonal, precipitation is of little value where such precipitation is unreliable from season to season.(4)

Dr Unstead has studied in some detail the application of these principles to wheat growing in Canada, and the graph (fig.9) prepared from his statistical table serves to indicate conditions over the Prairie Provinces.

(1) This was worked out for North America by Dr Unstead (Geog. Jour., Jan.-June 1912). Dr Unstead's paper is the basis of much of this section.
(2) Quoted in Dr Unstead's paper, p.424. (3) See pp.7[illegible]9.
(4) See particularly the conditions in Australia as worked out by Dr Griffith Taylor in "Agricultural Climatology of Australia." (Q.J. of Roy.Met.Soc.Oct.192[illegible])



CLIMATIC CONDITIONS in WHEAT GROWING on the CANADIAN PRAIRIE.

(Statistics from Unstead, Loc. cit.)

Fig. 83.

Temperature and Light Conditions in Canada

Table II.

Station	Long W. °	′	Lat. N. °	′	Altitude	Date when curve of mean temperature Exceeds 50C.	Falls to 10°C	Days in season	Mean Temp. C°	Total duration of light-hours	Mean daily duration of light-hours	Index of mean temp. plus mean darkness ①	Accumulated Temperature obtained in season	Required for wheat	Excess + or deficit −
Prince Albert	106	0	53	15	1432	Apr. 24	Sept. 12	141	13.3	2213	15.7	21.6	1166	1033	+133
Chippewyan	111	10	58	42	700	May 6	" 4	121	12.8	2051	17.0	19.8	938	894	+ 44
Fort Vermilion	115	56	58	30	950	" 3	" 3	123	12.6	2083	17.0	19.6	933	880	+ 53
Hay River	115	20	60	51	520	" 15	" 6	114	12.7	1992	17.5	19.2	876	848	+ 28
Fort Simpson	121	30	61	52	450	" 9	Aug. 30	113	12.6	2038	18.0	18.6	858	800	+ 58

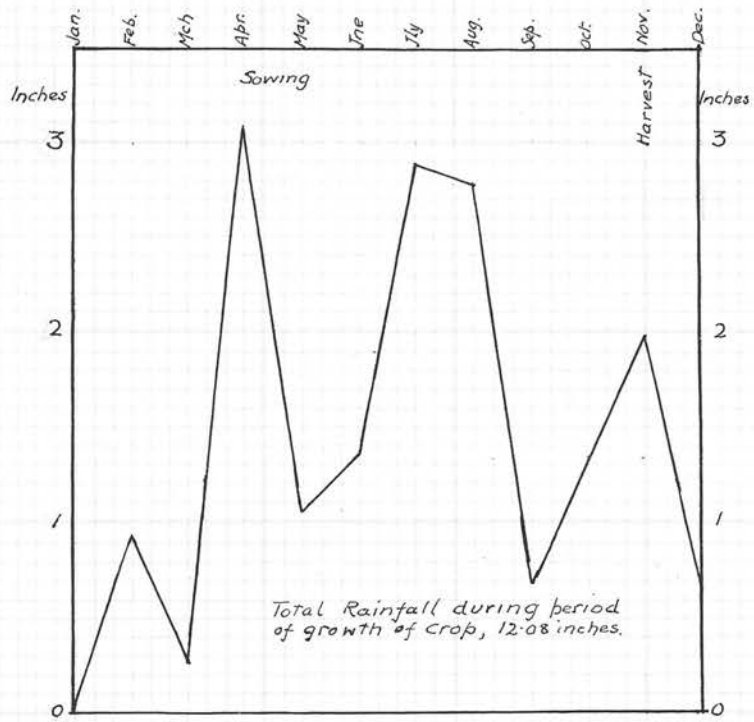
① Mean hours of darkness per day = 24 - mean daily hours of light.

The stations selected run through the southern portion of the prairie lands, while the short table, excerpted from Dr Unstead's Statistical Appendix gives some idea of conditions towards the climatic limit of wheat-growing. On the distribution map advantage has been taken of the map im Dr Unstead's article to insert the approximate limit of wheat cultivation.

From the graph the complementary relations between the mean daily duration of light and the accumulated temperatures are indicated; a parallelism between the total hours of light and the number of days in the wheat season is suggested; and the margin of safety between the accumulated temperatures for the season and the number of degrees necessary for wheat-growing made evident. Over the prairies temperature and sunlight are more important factors for wheat cultivation than is rainfall which is nowhere less than 11 inches per annum, - a total which is more than adequate in this area. "With the adoption of suitable methods of cultivation, including summer-fallowing and the use of drought-resistant varieties, wheat cultivation will be possible over the whole of the semi-arid region of southern Alberta and Saskatchewan." (1)

Among many interesting factors that limit climatically the agricultural development of Australia is the incidence and reliability of the rainfall. For the cultivation of wheat in the Commonwealth it may be assumed that suitable lands with a rainfall of over ten and under 20 inches in the growing period

(1) Unstead loc.cit. p.435.



Rainfall record for 1907 for a typical Wheat-growing district in South Australia. (Scientific farming has produced 30–40 bushels per acre from land under such rainfall conditions).

(From Griffiths Taylor's "Australia, Physiographic and Economic" p. 156.)

Fig. 10.4

period (April to October) are ideal. "With rain in April and May, and again in September or October, the Australian is assured of a fine crop."(1) Even in such areas the rains are not always reliable. Though the southern part where such winter rains predominate has a rainfall deviating over a period of twenty years, less than 20 per cent from the mean, the north of New South Wales has unreliable rains with a summer maximum, and is not well suited to wheat. On the other hand wheat is grown over areas with a growing-season precipitation of considerably less than 10 inches. In such cases dry-farming is necessary so that water may be retained in the soil which of course lies fallow in the season preceding wheat culture. The Australian rotation is a three-yearly one- fallow, wheat, grazing. Dry farming is practised in areas with very different annual rainfalls, which must be correlated with evaporation, so that in Victoria (Mallee country) land receiving less than 13 inches per annum, ~~xxxiassadxasxdryx~~ in South Australia less than 18 inches; in New South Wales less than 22-25 inches, is classed as dry.

The south-west of Western Australia between the coast and the 10-inch isohyet, named "Swanland" by Dr Taylor, grows increasing crops of wheat on lands that stretch at some points from the 30-inch to the 10-inch isohyets, the best areas having between 15 and 20 inches during the growing period.

For /

(1) "Agricultural Climatology of Australia" by Dr Griffith Taylor. (This section is based on Dr Taylor's examination...

Yield of WHEAT in AUSTRALIA and NEW ZEALAND

Fig. #5

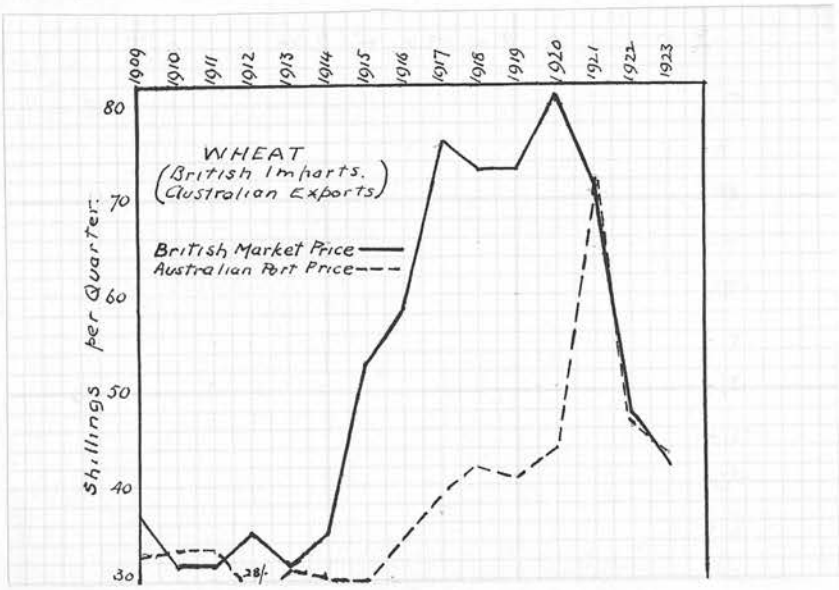


Fig #6

For Australia generally it may be said that, where surface and soils are suitable, wheat may be successfully raised in winter-rainfall districts between the 15-inch and 25-inch annual isohyets, but that with careful attention to tilth and fallowing the wheat lands may extend towards, and even beyond, the 10-inch isohyet. The physically and climatically available area is about 150,000 square miles of which about 10 per cent is at present under wheat.(1) Over much of the area irrigation is necessary either to take the place of poor rainfall or to supplement inadequate or unreliable precipitation.

The unreliable and irregular rainfall over the Australian wheat lands helps to explain the lowness and variability of the yield per acre there as compared with New Zealand, where the Brave West Wind rains are more regular and reliable. On the accompanying graph the yield for each Dominion is shown year by year from 1909-to 1924. Over this sixteen-year period the average yield per acre of wheat was 11.50 bushels for Australia and 28.66 bushels for New Zealand - a difference which the general lines of the graph amply demonstrate. Moreover within the same period the Australian yield varied between 2.58 bushels (1915) and 16.08 bushels (1923) while that of New Zealand showed extremes of 21.59 bushels (1916) and 34.75 bushels (1909). The quinquennial average yields are summarised in the table and show that New Zealand wheat fields produce roughly two and a half times as much per acre as those of Australia/

(1) See Dr Baker "The Potential Supply of Wheat" in "Econ.Geog.". March 1925.

Australia.

Table 7

	Average yield in bushels per acre		
	1909-13	1914-18	1919-23
Australia	12.14	10.60	11.44
New Zealand	29.89	25.86	31.17

It appears strange that New Zealand, with its high average yield (unparalleled perhaps in lands where intensive farming is not practised), does not export wheat, whereas Australia, with very low yields, exports largely. But New Zealand has preferred to specialise in dairy farming and to produce only sufficient wheat for her own demands, while Australian acreages have tended to expand and contract partly with the yield, but also with British market prices, along with the post-war promise of remunerative Government guarantees from the Commonwealth. In a note from Prof. Robt.D.Watt of the Agricultural Department, Sydney University, the following important points are made.

"(1) Australia has a vast area of land suitable for wheat growing: New Zealand very little.

(2) The typical wheat land of Australia is much cheaper (say £6 per acre) than in New Zealand (say £40 per acre). This is a different point from No.1, as, owing to climatic reasons the wheat land of New Zealand can be used just as profitably for other purposes - e.g., fat-lamb raising.

(3) Australian climate and other conditions permit of large-scale agriculture and the use of many labour-saving devices. Although the production per acre is greater in New Zealand the production per man engaged is greater in Australia.

(4) Australian wheat is of better quality - "Stronger," better colour (of flour), drier - and is more suitable for transport for long distances by sea.

The climatic and economic conditions under which wheat is grown in New Zealand are very similar to those of the United Kingdom. In Australia the conditions are entirely different

No 7

No amount of additional expense on the crop would ever raise the Australian yield per acre up to that of New Zealand or the United Kingdom although it could be raised 50% if all our farmers were farming up to the level of the best."

In India the distribution of wheat fields shows the importance of rainfall. Owing to the high temperatures heavier rainfall is necessary than in Canada or Australia, and the crop is raised mainly over areas with a rainfall of between 20 and 60 inches, - principally towards the lower isohyet in the Punjab. Much of the wheat is grown on irrigated lands on the lower side of the 20 inch isohyet. On account of their poverty the cultivators cannot afford to purchase artificial fertilisers, and as animal manure is utilised for fuel, little improvement in yield may be looked for, and any increase in total crop must depend on extension of irrigated areas. (1)

In other parts of the British Empire wheat may undoubtedly be grown; in most parts, except such humid lands as the Gold Coast, it is grown, but its production as an expert crop, is, for economic reasons, a question of the future.

(1) Ibid.

C A N A D A (1)

Within the British Empire the maximum wheat exporting country is Canada which contributes at present a little more than one-eighth of the total wheat crop of the world's harvests and holds second (2) place among the world's producing lands.

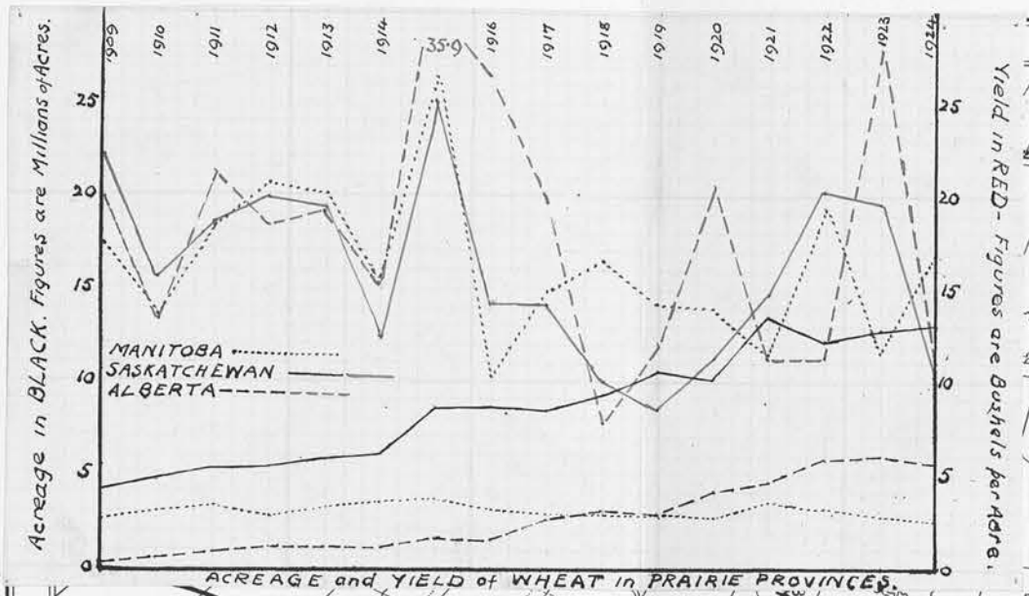
The following table shows the distribution of the Canadian Wheat crop for 1913 and 1923.

Table 8

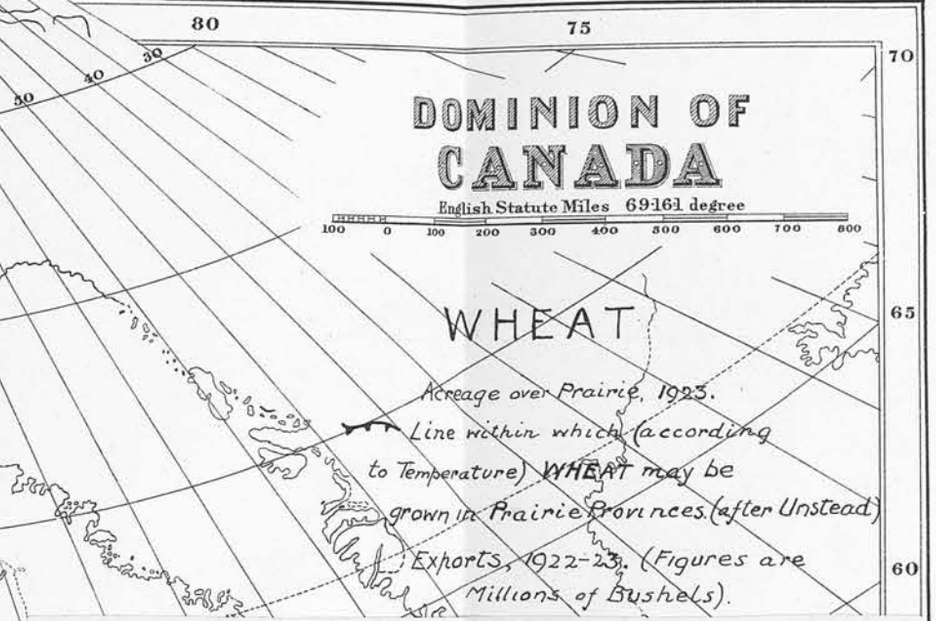
Province	Area 1000 acres		Yield 1000 acres	
	1913	1923	1913	1923
Nova Scotia	13	13	267	239
New Brunswick	13	14	269	275
Prince Edward Island	32	31	628	575
Total Maritime Provinces	58	58	1,164	1,089
Ontario	850	829	19,851	18,537
Quebec	58	74	1,054	1,194
Total Gulf Provinces	908	903	20,905	19,731
Manitoba	2,804	2,916	53,331	32,804
Saskatchewan	5,720	12,791	121,559	252,622
Alberta	1,512	5,958	34,372	166,834
Total Prairie Provinces	10,036	21,665	209,262	452,260
British Columbia	13	45	386	1,119
Total Canada	11,015	22,672	231,717	474,199
Fall Wheat (included in above)				
Ontario	739	717	17,669	16,599
Alberta	202	84	4,242	2,359
British Columbia	6	14	199	357
Manitoba	19	-	388	-
Saskatchewan	4	-	94	-
Total Canada	970	816	22,592	19,315

(1) See "Wheat Studies of the Food Research Institute" (Stanford Univ., California, July 1925.)

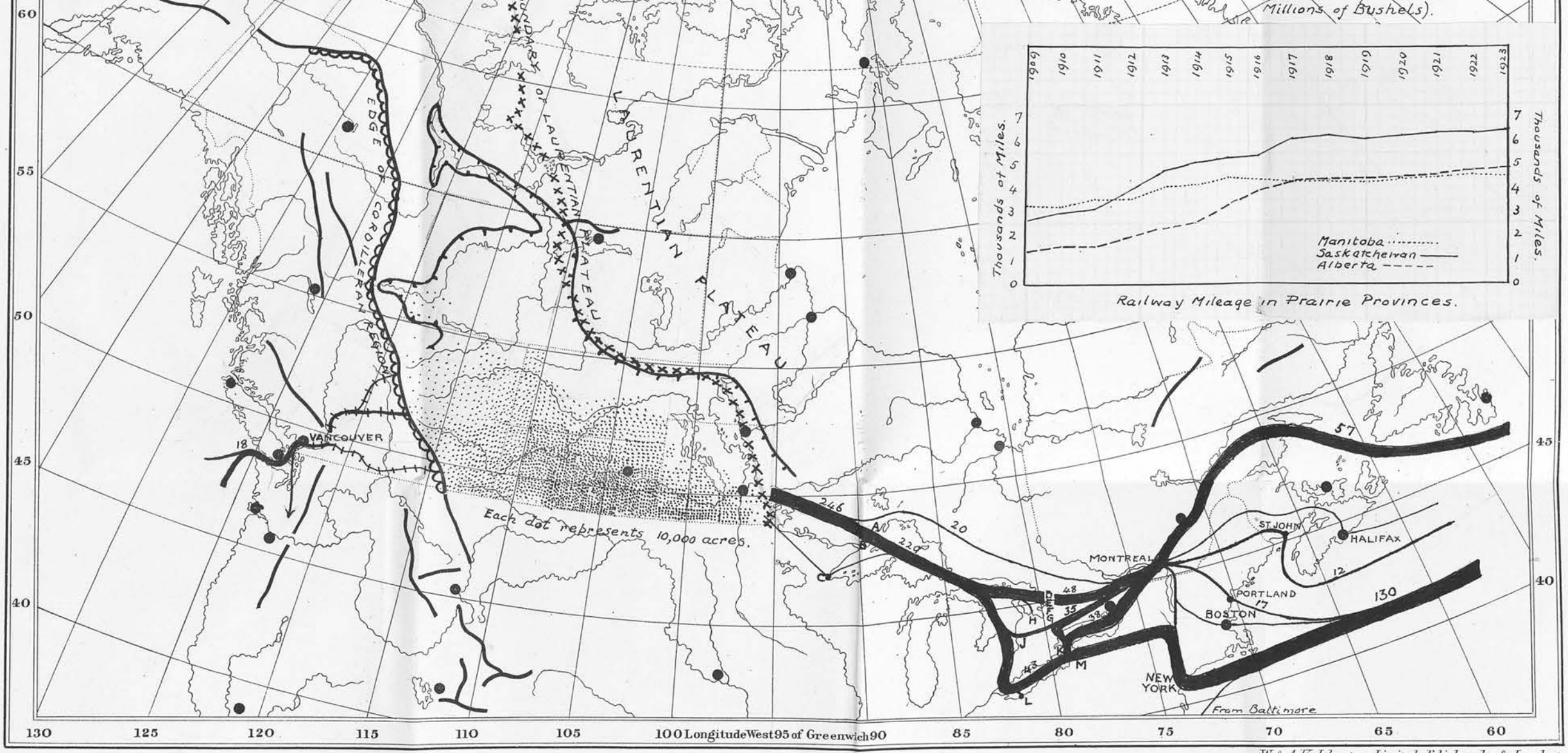
(2) in 1923.



ACREAGE and YIELD of WHEAT in PRAIRIE PROVINCES.



Railway Mileage in Prairie Provinces.



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LAKE PORTS.

LAKE SUPERIOR—
- A PORT ARTHUR
- B FORT WILLIAM
- C DULUTH

LAKE HURON—
- D DEPOT HARBOUR
- E PORT McNICOLL
- F TIFFIN
- G MIDLAND
- H COLLINGWOOD
- J GODERICH

(D-H are Georgian Bay Ports)

LAKE ERIE
- K PORT COLBORNE
- L FAIRPORT
- M BUFFALO.

The Prairie Provinces, 1923

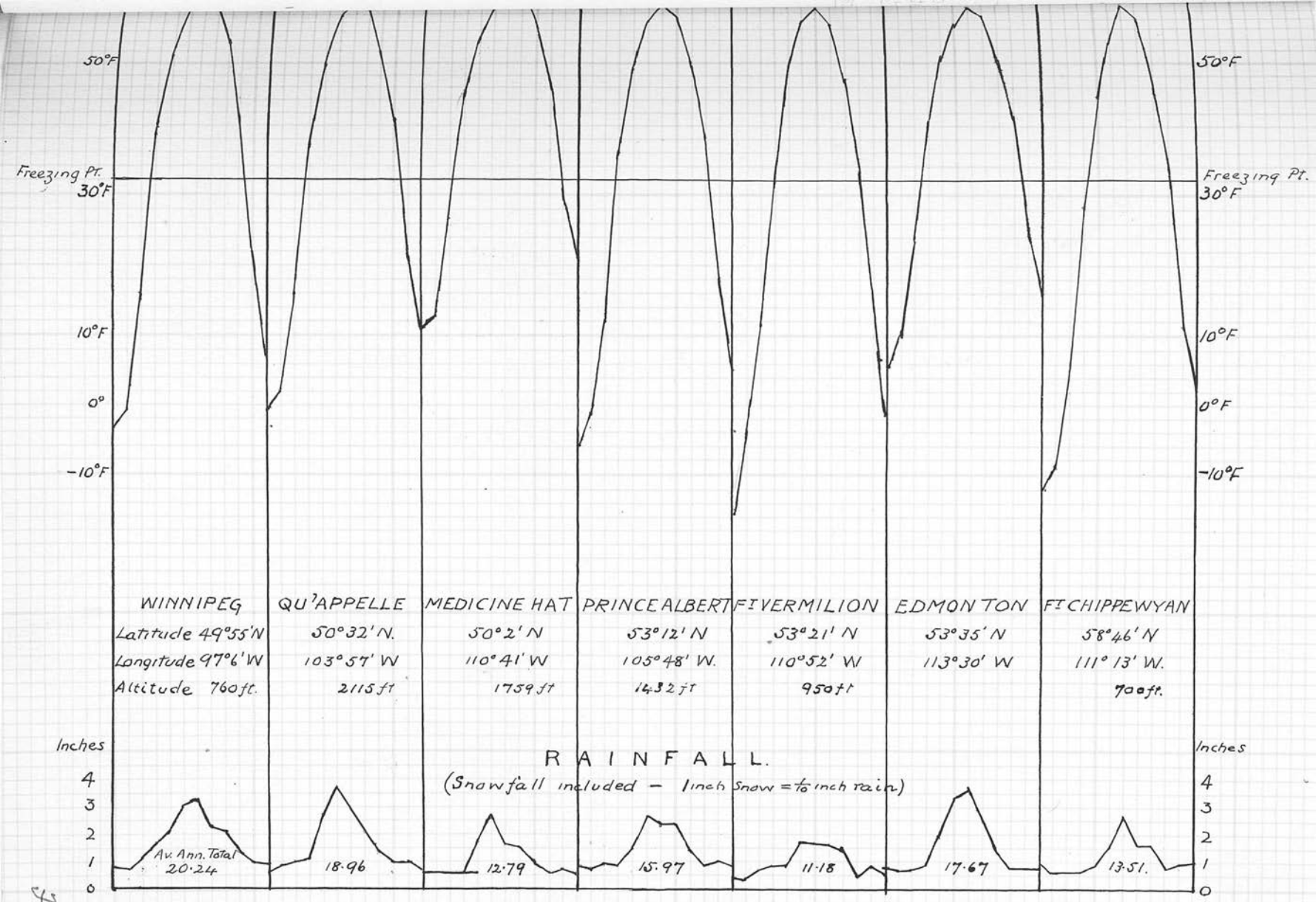
Table 9

Province	Total Area	WHEAT				Elevators. capacity 1000 bush.		Population Density per sq. mile (1)		Railway mileage	
		Under crop p.cent of total area		Yield per acre in bush.							
	1000 Sq.m.	1913	1923	1913	1923	1913	1923	1911	1921	1913	1923.
Manitoba	251.8	1.7	1.8	19.0	12.3	22,253	21,970	2.0	2.6	3,993	4,521
Saskatchewan	251.7	3.6	7.9	21.2	21.3	36,503	72,542	2.0	3.1	4,651	6,517
Alberta	255.3	1.0	3.2	22.8	28.1	11,566	36,854	1.5	2.3	2,212	4,784
Total	758.8	2.1	4.3	20.8	20.8	70,322	131,366	1.9	2.4	10,856	15,822

Since the Prairie Provinces supply over 95 per cent of the wheat grown in Canada it will serve the purpose to examine the conditions of production there.

"In this prairie region there is a rise on the whole from east to west, and this rise takes place in such a manner as to form what are known as the three prairie steps. The lowest level in this region is that of the Red River Valley, between 700 and 800 feet. West of that valley the surface rises to about 1,500 feet, and this terrace stretches westward for about 250 miles. The ground then rises to about 2,000 feet, and then the rise is more gradual to the foot-hills of the Rocky Mountains....For the future development of the Canadian Dominion this prairie region is of the highest importance, for it contains vast areas ready for the plough, with soil of the richest descriptions, and a climate admirably adapted for agriculture, though very different from/

(1) Land surface only.



Mean monthly Temperatures and Average Total Precipitation for certain Prairie Stations in Canada.

Average Crop Period (WHEAT) - MAY-SEPT.

from that of England."(1)

These prairie lands are being developed rapidly as the increase in the population of the provinces shows, while table 2 exhibits the progress of land under wheat. The graph

Population in census years — Table 10

	1901	1911	1921
Manitoba	255,211	461,394	610,188
Saskatchewan	91,279	492,432	757,510
Alberta	73,022	374,295	588,454
Totals	419,512	1,328,121	1,956,152

indicates how railways are extending over the prairie, preparing the way for economic settlement because they offer ready facilities for transport of crops.

But other aspects are carefully examined by the Federal Department of Agriculture under which the Experimental Farms Branch strives successfully to give the "Service to the Canadian Farmer" that its motto enjoins. Much work has been done on the prairie soils, the fertility of which is being closely studied in relation to loss of plant food resulting from crop relations and rotations, as well as from exhaustion after periods of fifteen or thirty years of crop and summer fallowing. Researches are being made on the irrigable soils of southern Alberta to determine their alkali content and so protect the purchaser against loss from rise of alkali under irrigation conditions. In 1923 a Division of Agricultural Bacteriology /

(1) Chisholm. "Handbook of Commercial Geog." 9th edition p.605.

Bacteriology was established to collect biological data for a more intensive study of the relationship between the organic matter content and the bacterial life of the soil. Continuous wheat cropping with fallowing every third or fourth year is using up the stores of nitrogen in the soil, and in Dr Shutt's words, "For the continued supply of available plant food, for the conservation of the necessary soil moisture and for the preservation of good tilth, the store of humus with its concomitant nitrogen must not be allowed to become depleted, and to this end the means are the adoption of a rotation, more particularly one containing a legume, and the keeping of live stock." (1) Mixed farming is increasing in the prairie provinces.

Over the prairies the climate is one of extremes (see graphs, fig.8). Winter cold precludes work on the land which, except in parts of Alberta, is frozen hard. Hence over by far the greater part of central Canada only spring wheat is grown. (2) Climatically the limit to the raising of spring wheat is frost especially towards harvest time in September when there is a serious risk of sudden and sharp falls of temperature. Sowing is generally carried out between April 20 and May 10 and the crop is ready for the binder between /

(1) Quoted in "Economic Resources of Canada" by Sir H.Rew, p.55.
(2) 4 per cent of Canadian wheat was 'fall' wheat in 1923; of that 3.5 per cent was grown in Ontario.

between August 10 and September 10. Thus the ninety days necessary for growth are secured during the height of summer when long days and sufficient rainfall favour rapid development, the rainfall diminishing as the plant ripens.(fig.~~14~~ 8).

The mention of frost suggests the problem that Canadian experts have done so much to solve, - the discovery of varieties of wheat adapted to Western Canadian conditions, the problem of early ripening crops. Until 1903 Red Fife, first selected about 1842 by David Fife, an Ontario farmer, was the leading variety grown. In that year a cross between this variety and Hard Red Calcutta produced the famous Marquis which ripens about a week earlier than Red Fife and gives a higher yield. Its introduction led to an extension of the area under wheat, and it is now cultivated on over 80 per cent of the wheat-growing lands of western Canada, as well as in the United States where it is stated that 70 per cent of the Spring Wheat acreage in 1923 was sown with Marquis seed. Later experiments have evolved other varieties in which the quality of rapidity of growth from seed to maturity has been further secured. Prelude Ottawa ripens about two weeks earlier than Marquis, and is grown in districts where formerly wheat growing was regarded as too risky. Ruby Ottawa 623 (1919) and Garnet Ottawa 652 ripens a week or so earlier than Marquis, but while the yield of Ruby is low, that of Garnet promises well.

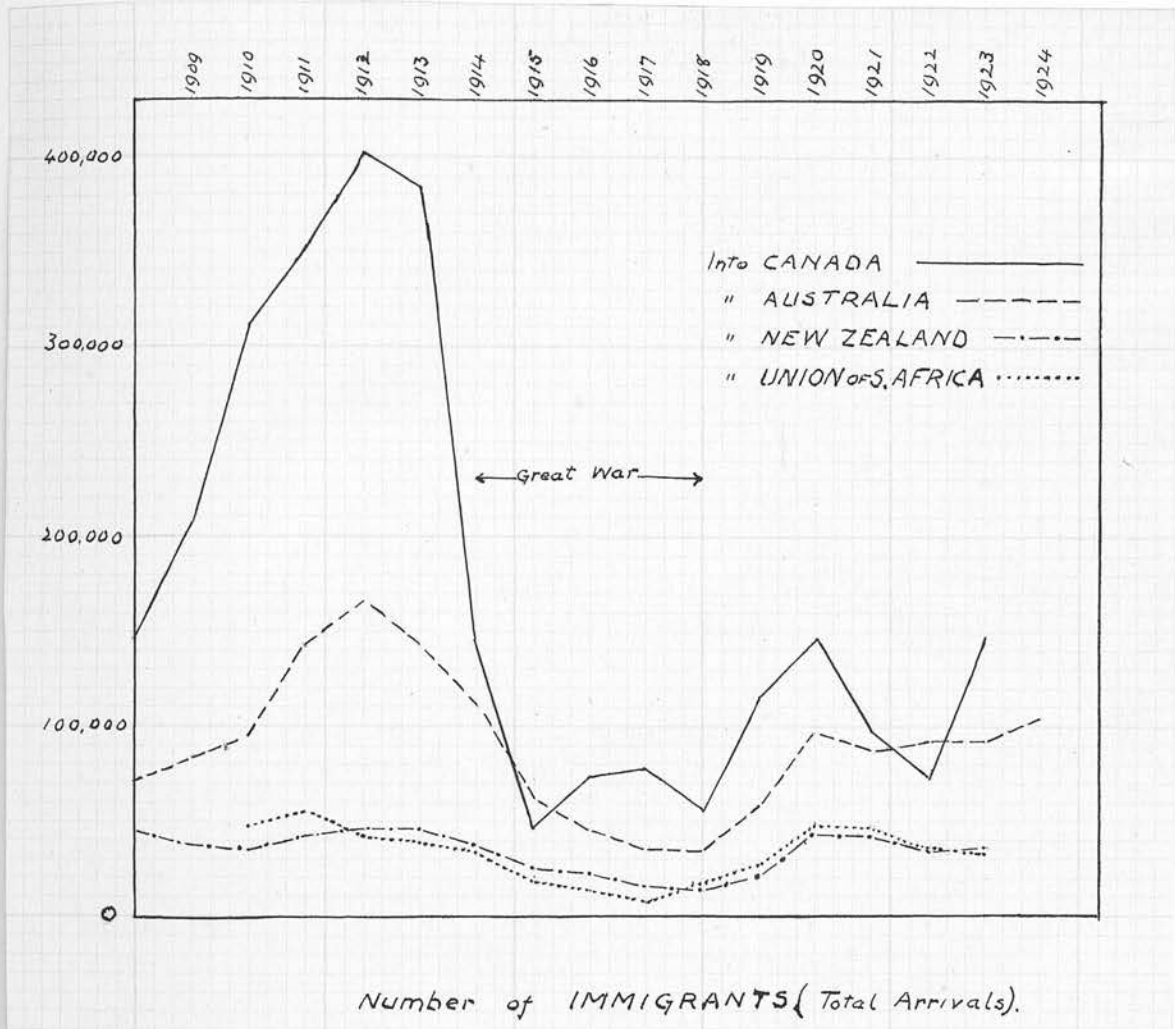
As /

As the result of such practical research the area under wheat is being extended into areas formerly regarded as impossible for this crop. It may reasonably be conjectured that new wheat lands will continue to be opened up as the scientist discovers other crosses which are adapted to still more rigorous climates.

How far, then, may wheat growing be extended in Canada, and what are the factors that must influence great increase of the area at present under that crop? Of the total land area of Canada it is officially estimated that over 30 per cent is available for agriculture. Under present methods of cultivation this would imply wheat-fields over 60 million acres with an average crop of about 1,000 million bushels, enough wheat for some 150 millions of people.

Some of the factors that must influence extension throughout the great potential region of wheat cultivation are obvious enough. Such are lack of cultivators and lack of transport facilities. Other factors are linked up with questions of price, for the crop must yield profit to the grower; the evolution of more rapidly ripening varieties of wheat; the extension of mixed farming; the price of land; and the increase of cultivation in other lands, particularly the recovery of Russia.

The graph (fig. 9) showing the course of immigration into Canada indicates one hindrance to development. A severe check to emigration from Europe was given by the War, and the poverty of many European/



Number of IMMIGRANTS (Total Arrivals).

Fig. 9

European peoples together with the high cost of passages to Canada has affected adversely any post-war rush. In 1923 the Canadian Government resolved to encourage the immigration of suitable settlers, and it may be hoped that the response will be gratifying to all concerned.(1)

After his crop is harvested and threshed the farmer delivers it to the nearest elevator, either selling it at once or storing it against a better price; or he may load it on cars direct from a loading platform, again either selling it on the spot or consigning it to a commission agent in Winnipeg. The second method is adopted by farmers who are dissatisfied with their treatment by the elevator companies. Improvements have been effected at the elevators, however, and in 1922-23 389 million bushels of western grain passed through elevators while only 34 million bushels were loaded from platforms.(2) In all cases the wheat is finally graded at terminal elevators, (some of which are owned by the Government), placed at convenient centres such as Winnipeg, Saskatoon, Moose Jaw, and Calgary, or in greater numbers at the head of navigation of Lake Superior where Fort William and Port Arthur dealt with almost 245 million bushels of wheat in 1923.

The hard spring wheat of Western Canada yields a flour high in protein and produces a very light bread. Because of these qualities it has created a demand abroad, where it is mixed with /

(1) Passage rates for agricultural settlers were greatly reduced in 1926.
(2) The success of the movement towards Wheat Pools has not yet been established (1925).

with softer wheats to produce a big, bold loaf. Canadian flour of this type is reckoned equal in value and quality with "Hungarian Hard".

Flour and grist milling is one of Canada's leading industries.[1] In 1921 there were 624 flour mills in operation with a total capacity of 128,225 barrels of flour per day. These have been erected throughout the provinces but the largest are in Montreal(Quebec), Kenora and Port Colborne(Ontario) and Winnipeg(Manitoba). This industry is naturally centralised in eastern Canada where labour is more plentiful, and of the 624 mills enumerated, 269 are in Ontario, and 192 are in Quebec. Generally there is a westward movement in the industry which will be accelerated as exports through Vancouver increase. On the average annual production of the period 1919-23 the export of flour just equals the quantity required for domestic consumption - about 8 million barrels, but the actual export shows an increase from 1921 (6 million barrels) to 1923 (10.2 million). Flour accounts for about 20 per cent of Canada's wheat exports, and the United Kingdom is the largest purchaser.

Canada exports more wheat than any country, the total for the international grain year ended August 1, 1923, being 279 million bushels of wheat and flour reckoned in terms of wheat. This huge quantity passes out either through the twin lake ports, Fort William and Port Arthur, or through Vancouver.

From/

(1) 1,333 in 1923.

From the elevators at the head of Lake Superior wheat for export converges on Montreal and Buffalo. To reach Montreal several routes are utilised in addition to the all-water journey through the great lakes. Thus cargoes are landed at port elevators on the east shore of Lake Huron - Parry Sound, Midland and Port McNicoll on Georgian Bay, Goderich on Lake Huron - and forwarded by rail. This is rendered necessary by the slowness of transit (15-18 hours) through the Welland Canal, a delay which will be reduced by the new canal at present under construction.(1)

Grain transported to Buffalo is partly transferred to rail for Baltimore and Philadelphia, but by far the greater quantity is carried by the Erie Canal to Albany whence some is railed to Boston while the bulk proceeds by the Hudson River to New York.

Lake vessels which often have a carrying capacity of 300,000 bushels (equivalent to 6 or 7 trains of 40 cars of 1200 bushels) are loaded by gravity direct from the elevators at rates of from 75,000 to 100,000 bushels per hour.(2)

United States' ports deal with a larger share of Canadian wheat exports than Canadian ports. In the crop year ended August 31, 1923, of 174 million bushels of wheat and 4.7 million /

(1) This new Welland Canal will be 25 miles long, with 7 locks each 800 ft. long, 80 ft. wide and 30 ft. deep. The estimated transit is 8 hours and the reduction of east-bound freight 2 cents per bushel.

(2) In 1923 Fort William - Port Arthur established a record by loading 6,700,000 bushels in one day.

million barrels of flour exported from Canada to the United Kingdom 72 per cent and 67 per cent respectively left via United States' ports. One reason for this - higher ocean and marine insurance rates from Canadian seaports - was brought to the notice of the Economic Conference held in London in 1923 when it was pointed out that the St.Lawrence route was now as safe as any other.

During the navigation season (May to October) practically all Canadian grain is exported through Montreal. This grain reaches the port by several distinct routes from Fort William and Port Arthur. It is calculated that only 5½ per cent of the wheat is carried the whole journey by water; much utilises the lake-rail route via Georgian Bay ports, Goderich, and Port Colborne. Large wheat vessels cannot economically proceed beyond Port Colborne owing to the narrow, shallow, and slow passage by the Welland and other Canals, the heavy insurance rates imposed for this part on both vessel and cargo, and the fact that a return cargo is uncertain. By unloading at Port Colborne the full value of large-vessel transport is secured, and a return cargo is fairly certain at Buffalo, Erie, or Cleveland. Thus the percentage of export that is borne without break of bulk to Montreal is no more that 1 of the 5½ mentioned above, the remainder being transhipped, principally /

principally at Port Colborne. Fuller information is contained in the table.(1)

Table 11.

Annual Canadian Wheat Exports by Lake-River. (percentages)

	Montreal direct	Port Colborne etc.	Georgian Bay ports	United States	Bushels millions
1913	10.7	20.4	18.4	50.5	141.7
1922	1.0	24.0	17.9	57.1	225.4

In the winter when water access to the coast is closed by ice from about Nov.25 till April 25, grain is exported by rail chiefly through the ocean ports of St.John (New Brunswick) and Portland (Maine, U.S.A.)

It is enlightening to calculate the costs of production, marketing, and transport of wheat from the Canadian prairies. Statistics for the purpose are fairly complete and are exhibited in the following table for a hypothetical bushel of wheat.

Cost of Wheat growing per acre, 1920

	s.	d.		s.	d.
Use of land	15:	7	Machinery	6:	3
Seed	13:	4	Twine	2:	-
Manual labour	12:	5	Threshing	11:	1
Horse labour	16:	8	Hail Insurance	8:	11
				86:	3

Yield, per acre, say 20 bushels makes cost per bushel 4: 3¾d.

To this must be added the varied costs of transport from the prairie to Liverpool -

Country/

(1) See "The Grain Trade of Montreal" in "Economic Geography" for March, 1925.

	Pence per bushel
Country elevator	0.875
Commissions on shipment from country	0.500
Average rail rate	6.000
Weighing and inspection in and out, including lake shippers' charge	0.125
Terminal handling	0.625
Cash grain brokerage, double charge	0.063
Vessel brokerage, say	0.063
C.I.F. and F.O.B. brokerage	0.125
Lake freight to Montreal, say	5.500
Lake insurance to Montreal	0.125
Brokerage and elevation to seaboard	0.187
Shipper's profit to seaboard, say	0.187
Ocean freight from Montreal to Liverpool	4.500
Ocean insurance, say	0.250
Outturn insurance, say	0.250
Exporter's profit, say	0.312
Brokerage at Liverpool, varies about	0.375
Unloading Liverpool and other charges	0.500
Interest and brokerage	0.375
	20.937
	or, say, 1s. 9d.

Thus the total cost of production, marketing and transport to Liverpool works out at 6/0¾. The average value per bushel of wheat imported into the United Kingdom (Mean of 1921 and 1922) was about 8/-.

Various schemes to expedite the export and reduce the congestion of the prairie output have been discussed. It is evident that the short navigation season by the Lakes and St.Lawrence waterways, fettered through the slowing up of traffic as it is by the Soo, Welland, and other canals, must force wheat through the seaports of the United States. To make the St.Lawrence available for sea-going vessels would not obviate this difficulty, nor would the Georgian Bay Canal relieve the congestion. The former scheme "has been deferred

for /

for the present, after consideration by the Governments of Canada and the United States;"[1] the great cost and the time lost in locking are serious drawbacks to the latter project.

With regard to the possibilities of an outlet through Hudson Bay it must be remembered that Hudson Straits are safe for navigation by ocean-going vessels only between August 1 and October 1. Local demands, in Saskatchewan particularly, led to the laying of a branch single-track line 300 miles long, between Hudson Bay Junction on the Canadian Northern Railway and Pitwitonei on the Nelson River comparatively near Hudson Bay. But the scheme, evolved from the British instinct of access to the open sea, has been practically condemned by the Canadian Railway Commission of 1917. Their Report sums up the economic case thus - "Considering the small advantage in rail mileage from the grain-growing areas, which the Hudson Bay possesses over the existing routes to Port Arthur, and that from many districts it possesses no advantage at all; considering further the short and uncertain period of navigation in the Bay, and that grain consigned to Port Nelson will consequently always be liable to be detained there for nine months till navigation is again opened; considering that higher ocean freights may be expected to absorb, if not more than absorb, any possible saving in rail rates, we cannot believe that this route will ever secure any serious share in the export trade."

For Western Saskatchewan and Alberta perhaps the most significant /

(1) The Canada Year Book 1922-23 p.658.

significant move has been the development of export through Vancouver. From this port a rapid expansion of trade with the Orient, with Australasia, and with Europe through the Panama Canal, has taken place. Wheat has become a significant export only since 1921 as the accompanying table shows -

Wheat and Flour Exports through Vancouver

	Total Export	To United Kingdom	
	Wheat million bushels	Wheat million bushels	Flour barrels
1921-22	7.8	-	-
1922-23	17.8	10.5	78,832
1923-24	53.8	-	-

That this trade will continue to grow rapidly, there is no doubt, and Vancouver has the advantage over the east coast outlets of an ice-free harbour. Already elevators have been built with a capacity of about 6,000,000 bushels; while a government terminal elevator at Edmonton has recently been constructed which cleans and grades wheat for shipment through the port.

It is expected that practically all the grain of Alberta and western Saskatchewan will leave Canada by the Pacific gate where New Westminster and Prince Rupert share the trade with Vancouver. In 1925 rail rates from the prairies to the west were equalised with those to eastern ports in proportion to mileage, and a reduction of 5 per cents per bushel effected in the cost /

cost of shipping grain from Calgary to Liverpool via Vancouver (1) compared with the eastern route. On the other hand purchases of wheat by the Orient are large only when prices are low.

As matters are at present there is every probability of keen competition for freights between eastern and western Canada. (2)

(1) In 1925 the railway rate from Calgary to Vancouver (800 miles) was reduced from 22 to 13 cents per 100 lbs.

(2) In 1925 the following rates obtained -

Calgary to Liverpool	Cents per bushel
via Fort William and Montreal	39.6
" " Buffalo and New York	43.1
" " and St.John	48.7
" Vancouver and Panama Canal	35.9

A U S T R A L I A

Table 12

	Area (1000 acres)		Yield (1000 Bushels)		Yield per acre	
	1913	1923	1913	1923	1913	1923
New South Wales	2,230	2,942	32,467	28,661	14.6	9.7
Victoria	2,085	2,644	26,223	35,697	12.6	13.5
South Australia	2,080	2,453	21,496	28,785	10.3	11.7
Western Australia	793	1,553	9,169	13,857	11.6	8.9
Queensland	125	145	1,976	1,878	15.8	12.9
Tasmania	25	25	630	570	25.0	22.6
Northern Terr.	-	-	-	-	-	-
Federal Terr.	1	1	21	7	20.5	13.8
Total Commonwealth	7,340	9,764	91,981	109,455	12.5	11.2

The story of wheat-growing in Australia is very closely related to that of weather conditions. This is well enough illustrated in the above table which indicates vagaries that almost defy any statement of principles. One key to the problem is drought which affects every aspect of Australian life from agricultural produce and animal numbers to the distribution of population. Thus the Great Drought of 1902-3 not only ruined the wheat crop and sadly depleted the number of sheep in Australia, but led to departures of population exceeding the arrivals for the two years 1903 and 1904 by almost 13,000, while the excess of births over deaths was only 51,150, compared with 54,698 in the preceding, and 60,541 in the succeeding year.(1) It is in the borderlands between the true /

(1) Official Year Book No. 9, p. 94.

true arid regions and the well-watered districts that drought is most feared, for these parts contain the principal wheat fields and the great stock farms. "As regards the inland portion of South Australia, Victoria and New South Wales, very dry conditions or true droughts have occurred about once every three years."(1) More or less within the period at present under consideration the years 1902, 1907, 1911, 1914, and 1919 have brought great sorrow and loss to Australia. As yet the causes of these droughts are not understood, though much painstaking observation and comparison has been carried out within the affected areas.(2)

Australian wheatlands lie within the region of winter rains, forming the largest Imperial stretch of lands with a Mediterranean climate. This type of climate is regarded as that best suited for wheat which is sown in Autumn, germinates before winter, and tillers in the moist mild winter to ripen in the rising temperatures of late spring. The present wheat belt of Australia lies between the April-October isotherms of 52°- 62° F, with isohyets for the same period of 10-25 inches. These regions extend from the east of the Great Australian Bight to southern Queensland, lying mainly west of the Great Dividing Range; from the west of the Bight almost to Shark Bay in Western Australia.

As settlement in Australia proceeds/cultivation wheat will be extended to the north-east of Albany, to the north of Eyre's/

(1) "Australian Meteorology", by Griffith Taylor, p.164.
(2) Ibid p.248.

Eyre's Peninsula, and into southern Queensland.[1] At present "partly as a result of the expectation of higher profits from wool than from wheat, and partly as a result of the tendency of the population to drift into urban areas, wheat production in Australia shows less progress than might have been anticipated in a country with such considerable fertile areas.....The increasing cost of wages and of farming machinery cannot be ignored. If, and when, Russia again becomes an important exporter of wheat, the Australian wheat farmer must be expected to suffer seriously.....unless by that time the Australian farmer is able to extract, at a relatively small increase in cost, a heavier average crop than at present."[2]

(1) Ibid. p.291.
(2) Survey of Overseas Markets. p.346.

N E W Z E A L A N D

In New Zealand the climatic conditions differ greatly from those of Australia and more nearly resemble those of Great Britain. The Brave West Winds, of which only the northerly fringe reaches southern Australia and then only at the period of the winter solstice, blow regularly over New Zealand.

New Zealand - Wheat — Table 13

Season	Acreage (thousand acres)	Production (million bushels)	Average Yield per acre (bushels)
1912-13	190	5.2	27.3
1922-23	276	8.4	30.4
1924-25	167	5.4	32.6

Wheat is grown most largely in the South Island where Canterbury produces over 70 per cent, Otago and Southland 25 per cent, of the total crop; the ~~remainder~~ rest of South Island and the whole of the North Island contribute the remainder. The relatively high yield per acre is stated ~~xxxx~~ not to be due to intensive farming, ~~but~~ is ascribed partly to the use of artificial manures, and partly to the economic law of marginal utility under which higher returns in value from other modes of using land keep the naturally poorer or less favourably situated lands off the plough. Thus in 1915-16 when the area was 329,207 acres the yield fell to 21.6; in 1919-20 over an area of 139,611 acres ~~xxxxxxxxxxxxxxxxxxxxxx~~ it was 32.7 bushels per acre. These figures, as well as those given in the Table, suggest that farming is becoming intensive.

Within /

Within recent years the export of wheat from the Dominion has almost ceased, while import has been necessary to supplement the domestic crop. New Zealand estimates her annual consumption for food, seed, and fowl-wheat (grain rejected by millers) at 7¼ million bushels per annum, and any surplus in the annual crop is carried over to the next year. Other necessary crops or more profitable uses of the land, under a small population, tend to encourage this policy, and export is not likely to be resumed on a large scale for some time. Hence New Zealand does not occupy a line in Table 1. (p. 1)

UNION OF SOUTH AFRICA

Wheat production in the Union of South Africa averages about 70 per cent of the requirements of the country which are estimated at some twelve million bushels. Local supplies are thus supplemented to the extent of 30 per cent by imports which serve partly to determine prices.

As in Australia wheat is a winter crop, and is grown most largely in the Mediterranean region of the Cape Province where the Darling, Malmesbury and Piquetberg neighbourhoods, situated in the coastal belt to the north of Cape Town, with the more productive districts of Caledon and Bredasdorp to the south-east, yield about 40 per cent of the crop. The somewhat low yield of about 12 bushels per acre is explained partly by lack of fertility in the soil, partly by insufficient culture of the soil. Fertilisers (guano and superphosphate) are used generally to enrich the soils in phosphoric acid and lime, and leguminous plants are cultivated for the sake of their nitrogenous content. Secondary areas of production are the central north-east Cape and the north-eastern Orange Free State.

Sowing is carried out in April to June, the latter month for the later varieties. Crops are harvested in November and December when prevalent winds occasion frequent loss by shattering. Early varieties tend to escape these winds, but such grains are poor tillers and must be thickly seeded

(40 lbs. per acre). Research into more suitable wheats is being steadily pursued in the Government Experiment Stations.

Exports of grain are small and decreased from about 260 cwt. in the pre-war period to 155 cwt. in the post-war. Flour exports are larger and show an increase in the post-war period to 20,000 cwt. against the pre-war 13,735 cwt. In view of local requirements and large imports such small totals of trade are not to be wondered at. Net imports remain fairly constant at about 5 million cwt. of wheat and 3½ million cwt. of flour and meal. It seems strange that the Union is not self-sufficing in its wheat requirements, but neither crop nor import figures suggest that any advance in local production is being secured.

I N D I A

Wheat growing in India is most largely developed in the Punjab and the United Provinces which in 1922-23 contained approximately 40 and 30 per cent respectively of the area under this crop. In each of these provinces 50 per cent of the area under wheat was irrigated land. For the whole of India the crop covered 24,407,619 acres of which 40 per cent was irrigated. The distribution is shown in the following table.

Acreage under Wheat 1922-23 (1)

Table 14

Province	Total 1000 acres	Of which irrigated per cent
Punjab	9,620	52
United Provinces	7,057	49
Central Provinces and Berar	3,007	1
Bombay	2,028	27
Bihar and Orissa	1,266	24
North-West Frontier Province	1,123	34
Bengal	125	25
Burma	85	1
Delhi	49	39
Madras	30	20
Ajmer-Merwara and Manpur Pargana	17	53
Total	24,407	40

From considerations of climate wheat is necessarily a winter crop in India. In non-irrigated fields it is sown after a summer fallow, and depends largely on the natural conservation of the soil moisture from the preceding monsoon. Provided that the rainfall during January and February is not excessive it is beneficial to the crop, but excess at that season favours development of rust and causes a diminution of yield. On/

(1) The average yield per acre was 13.2 bush.

On irrigated land two to four waterings are usually given. Harvesting operations are generally carried out early in the hot season in March and April and by the end of May the crop is ready for marketing. While there is a ready demand among European importing countries for any surplus, prices are lower than those given for ~~countries~~ Canadian or Australian grain. This is due partly to the soft nature of the wheat, partly to bad grading and partly to adulteration with barley and dirt. Against this it must be remembered that Indian supplies are available at a season when European stocks are low.(1)(2)

In the following table the percentage of wheat and flour exported between 1909 and 1923, with the average for each quinquennium, is shown

Percentage of Indian Wheat exported by sea - Table 15

1909	1.4	1914	14.4	1919	6.3		
1910	10.9	1915	7.0	1920	0.2	1909-13	11.1
1911	12.6	1916	7.5	1921	3.5	1914-18	10.2
1912	13.7	1917	7.3	1922	0.8	1919-23	2.6
1913	16.8	1918	14.7	1923	2.2		

These percentages show considerable variations. During the war period government control supervened, and large bodies of troops had to be fed in India, Mesopotamia, and elsewhere. Shipping tonnage was not available for ordinary course of trade, and the markets of Central Europe were closed.

But the comparison of pre-war and post-war periods is interesting both from economic and political standpoints. In the pre-war period the low export of 1909 is a reflection of famine conditions in India, and the post-war years 1920 and 1922/

(1) "Pusa 12" evolved by Mr and Mrs Howard, is said to rank with Manitoba spring wheat.

(2) The value of elevators in which grain may be economically stored till it may be most profitably marketed is being gradually realised. Elevators would also tend to lessen railway congestion.

1922 were also years of shortage in India. On the other hand it is during this period that political causes were at work restricting exports. There is no doubt that demand abroad has extended and improved cultivation in India; and that the demand continues. There is equally no doubt that a bad season so reduces the crop that import is necessary. Imports were heaviest in 1909, 1919, 1920 and 1922; and in 1922 nearly nine million hundredweights were imported. In such years exports are necessarily small.(1) Hence the average production of the post-war lustrum is lower than that over the period 1909-13(Table 5 p.64). The average area under wheat in 1909-13 was just under 24 million acres; in 1919-23 rather over 24 million acres. It may be expected that, given average seasons so far as weather is concerned, the rain-grown crop will increase, and it is certain that the crop from irrigated fields will continue to become greater.

(1) "The two uncertain factors are the final output, and the domestic consumption, the latter showing a rapid increase arising from the ability and tendency of the peasantry to resort to richer types of foodstuffs than have been customary." ("The Economist" Vol.99(1924) p.103).

As to the possible increase of wheat production over the land surface of the globe physically available for the crop ($5\frac{1}{2}$ million square miles), the Economist of the United States Bureau of Agricultural Economics estimated a potential crop a century hence of some 12,000 million of bushels. He qualifies this by ~~producing~~ predicting the more extensive use of fertilisers, the development of a greater live-stock husbandry to provide manure, a widespread increase in agricultural knowledge and skill, a price which will adequately reward the farmer, and world peace; and further by a decreased per caput consumption of meat among wheat-eaters since pasture-lands will be required for cropping, as well as by rising prices accompanying the cultivation of poorer lands.(1)

Towards this potential yield the British Dominions will contribute about 20 per cent -

Canada	1,300	million	bushels
Australasia	450	"	"
Union of S.Africa (?)	200	"	"
India	500	"	"

Such a forecast has at present mainly an academic interest. To speculate on the export trade of a century hence one would have among many problems to form estimates of the population of each part of the globe, the likelihood of domestic consumption among peoples who at present regard the crop as a luxury or do not consume it at all, the probability of future wars, and the possibility of other competing foodstuffs.

(1) See a most interesting article on "The Potential Supply of Wheat", by Dr Baker in "Economic Geography" (Clark Univ. Mass. U.S.A. Mar., 1925).

ANIMALS and THEIR PRODUCTS

Cattle in the British Empire (1)

(Number in thousands for nearest year) Table 16

	1913	1923		1913	1923
British India	72,669 (2)	116,665	Tanganyika Terr.	-	3,147
Australia	11,484	14,337	Nigeria	(3)	2,824
United Kingdom	11,915	12,059	Kenya Colony	800	2,814
Canada	6,597	9,246	Rhodesia	600 (4)	1,801
Union of South Africa	5,797	8,557	Ceylon	1,004	1,386
New Zealand	2,020	3,481			

(1) Figures mainly from Commonwealth Year Book No.17.

(2) 1910, exclusive of Eastern Bengal.

(3) No returns. (4) Horned cattle in Southern Rhodesia.

Of nearly 540 million cattle enumerated for 57 countries, the percentage share of the Empire as shown above was almost 33 in 1923. So far as Empire trade is concerned the herds of India may be deducted from this total. ~~Cattle~~ Cows are protected ~~on the one hand~~ under the Hindu religion; on the other hand ~~they~~ oxen are bred largely for draught purposes. Dairying is a very large indigenous industry in the villages where, however, promiscuous breeding retards efforts to improve the quality of the stock.

~~103~~

British Meat Imports (1) (Principal Sources only).

17
Table 35

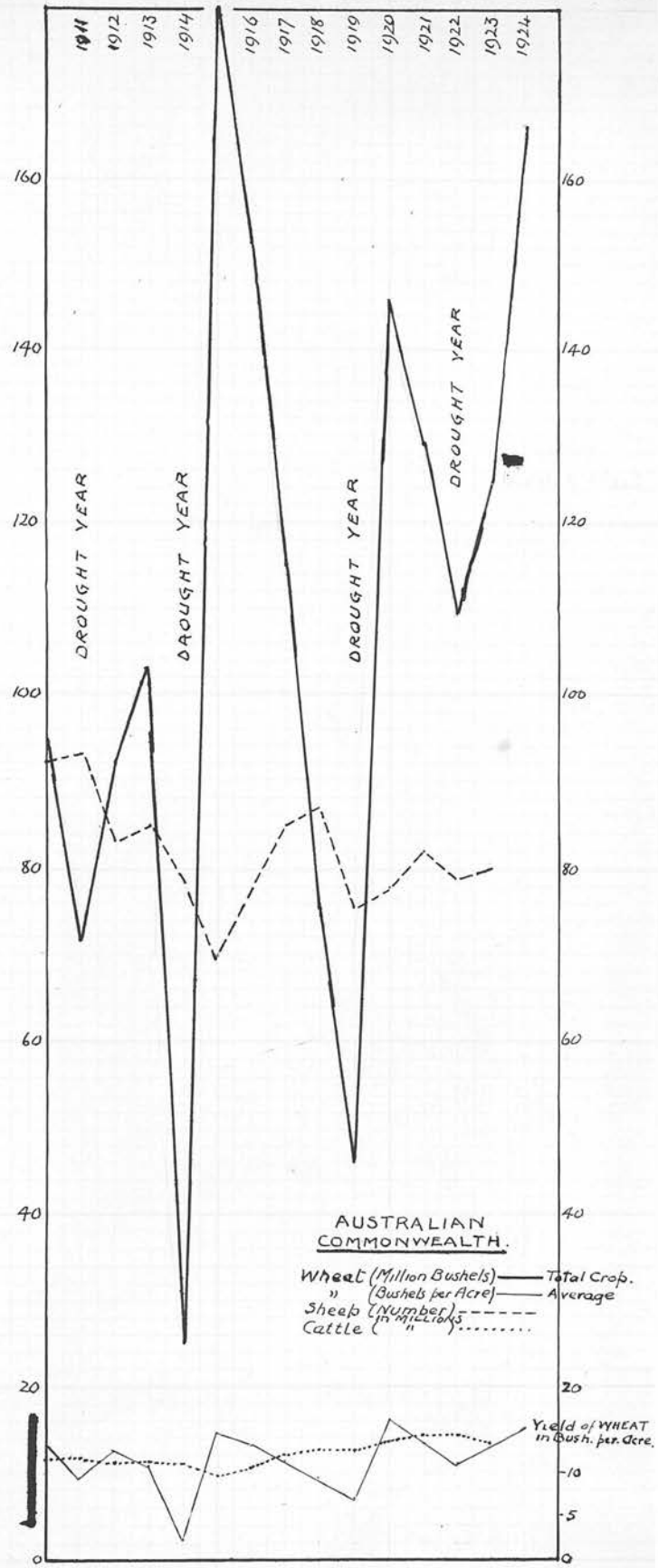
Kind of Meat	Estimated Consumption per head		IMPORTS from								Total Imports	
			Australia		New Zealand		Canada		Empire			
	1909-13	1924	1910-14	1920-24	1910-14	1920-24	1909-13	1924	1909-13	1924	1909-13	1924
	lbs	lbs	per cent		per cent		per cent		per cent		1000 tons	
f and Veal	68.7	70.8	—	—	—	—	—	—	16.9	13.3	420	713
ton & Lamb	30.8	22.6	25.8	17.6	41.3	48.6	—	—	61.8	55.4	285	260
k, bacon, etc.	39.1	42.4	—	—	—	—	8.8	15.0	8.0	13.9	314	498

(1) Figures mainly from Cmd.2499, are annual averages, except for 1924.

So many points of interest and importance to British trade emerge from the above tables that it will be profitable to consider briefly the conditions governing the production and marketing of foodstuffs of animal origin.

Geographically the study is mainly one of grasslands of varying richness in "new" countries where land is cheap, population is not dense, animals are numerous, and where, therefore, a large surplus of animal products is available for export. Such grasslands are most extensive, so far as the British Empire is concerned, in Australia and New Zealand, the Union of South Africa, and Canada.

Australian grasslands cover the eastern part of ~~this~~ at island continent and include the narrow coastal plain, elevated tracts such as the Darling Downs, plain areas such as the Victoria valley, and the great Murray basin including the rich Riverina /


1911
1912
1913
1914
1916
1917
1918
1919
1920
1921
1922
1923
1924
DROUGHT YEAR
DROUGHT YEAR
DROUGHT YEAR
DROUGHT YEAR
160
140
120
100
80
60
40
20
0
AUSTRALIAN
COMMONWEALTH.
Wheat (Million Bushels) — Total Crop.
" (Bushels per Acre) — Average
Sheep (Number in Millions) - - - - -
Cattle (") .....
Yield of WHEAT in Bush. per Acre.
20
10
5
0

10

Fig. 4

Riverina country. Over all pastures where adequate rains provide sufficiently nutritious grasses large herds of cattle graze, while on the lower mountain slopes and poorer pastures millions of sheep feed. Pigs are raised most numerously where dairying industries are practised, for they are economic consumers of the waste of the dairies. In the following table the numbers of these animals are given according to area and population for each state so that the distribution may be seen, and the possibilities of trade understood.

Table 36 18

	SHEEP				CATTLE				Percentage Dairy Cows	
	Per Head of Pop.		Per sq.mile		Per Head of Pop.		Per sq.mile			
	1913	1923	1913	1923	1913	1923	1913	1923	1913	1923
mania	8.7	7.1	66.5	59.5	1.0	1.0	7.8	8.3	28.6	31.8
toria	8.6	6.8	137.8	133.9	1.1	1.0	17.3	20.3	43.1	46.5
South Wales	21.7	16.8	125.1	112.2	1.5	1.3	9.1	10.5	29.0	26.6
ensland	33.0	20.7	32.5	26.3	8.1	7.9	7.9	10.4	7.3	8.0
th Australia	11.5	12.5	13.4	16.6	0.8	0.8	0.9	1.1	31.4	34.1
tern Australia	13.8	18.6	4.5	6.8	2.6	2.7	0.9	1.0	3.6	6.3
thern Territory	18.3	1.3	0.1	0.0	113.7	237.3	0.8	1.5	-	-
onwealth	17.5	13.9	26.4	26.5	2.4	2.3	3.7	4.8	18.0	17.2

So far as cattle are concerned these statistics bear out the forecast of Dr Griffith Taylor[1] that "There seems little doubt, however, that in the near future Queensland and Northern Territory will become the chief cattle strongholds." This is shown by the percentage of cattle in the various states and territories but the percentages of actual increase in 1923 over 1913 by divisions/

(1) "Australia: Physiographic and Economic" (1914) p.138.

(1)

divisions show that the Northern Territory with 102 and Queensland

Percentages of Cattle — Table 19

	1913	1923		1913	1923
New South Wales	24.5	22.0	Western Australia	7.3	7.1
Victoria	13.3	11.9	Tasmania	1.8	1.7
Queensland	46.3	47.9	Northern Territory	3.6	6.3
South Australia	3.1	3.1	Federal Territory	0.1	0.0

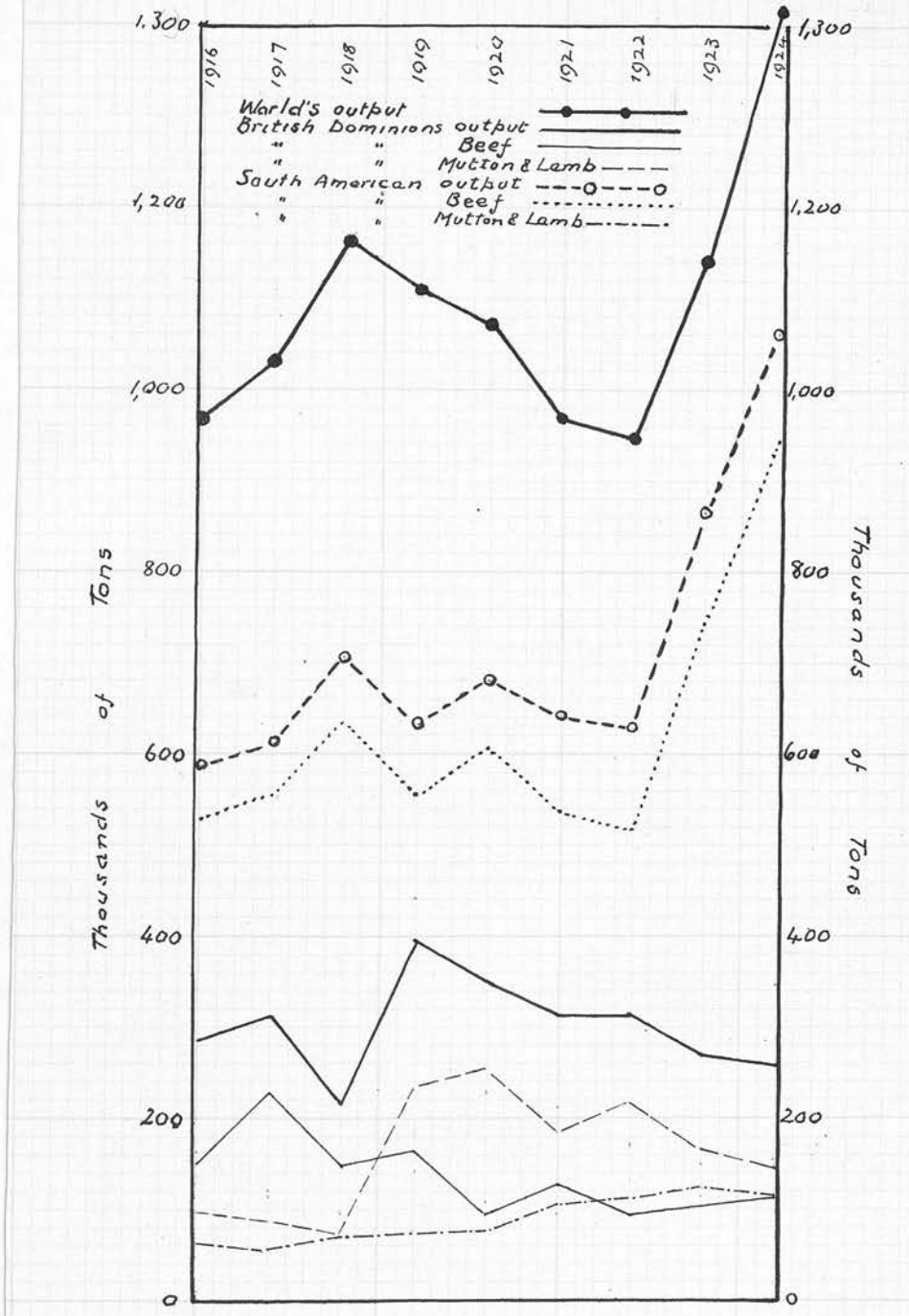
with 20 indicate even more strikingly the advance in these parts, compared with South Australia(17), Western Australia(14), Tasmania(7), New South Wales(4) and Victoria(4). In the Northern area beef-cattle are mainly raised; in the southern, the cooler and more equable climatic conditions of the coastal regions are specially favourable to cattle bred for dairy purposes. Such a division is equally true in Scotland where the mild, wet south-west districts are noted centres of dairy produce, while the severer climate of Aberdeenshire is more suited to beef-stock. This is shown by the percentage of dairy cows given in Table (18).

Despite the possibility of increasing very considerably the number of beef cattle in Australia there are factors which hinder the development of exports of beef to the United Kingdom. Perhaps the greatest of these is distance, which means that all beef must be frozen, and frozen beef, not being greatly in demand, fetches the (2) lowest prices on the British markets. Thus the trade is unremunerative to the producer. There is, therefore, little

inducement /

(1) "Somewhat similar climatic controls obtain in the Kimberley region of tropical West Australia. Here along the Fitzroy River are vast plains covered with rich grass, and large areas maintain 20 cattle to the square mile, giving a total of about 600,000 head." (Griffith Taylor "Agricl.Climatology of Australia" p.350).

(2) 50s.cwt.against 64s.for Argentine chilled beef (1924) Cmd.2499 p.11.



World's Output of Frozen and Chilled Meat Exported 1916-1924.

(Based on Weddel's "Review of the Frozen Meat Trade, 1924.")

11

Fig. 16.

inducement to the farmer to improve his stock, and by better breeding hasten maturity to permit of earlier slaughter. Such improvements are a necessary condition, along with better grading and standardisation, for trade development, and should not be delayed. As transport is speeded up and refrigeration improved, Australia would benefit if the quality of her beef could compete with that from the Argentine estancias At present Australia has but a small share in the low percentage of Empire beef imported into the United Kingdom.

Table 20.

	Dairy Cows		Milk Yield per cow		Butter		Cheese	
	1909-13	1919-23	1909-13	1919-23	1909-13	1919-23	1909-13	1919-23
	Thousands		Gallons		Per cent		Per cent	
New South Wales	823	755	275	311	39.9	35.8	32.7	23.9
Victoria	661	644	306	343	37.4	34.4	27.4	21.2
Queensland	365	448	221	242	15.8	20.2	25.0	40.1
South Australia	115	115	256	315	4.8	6.2	10.7	11.0
Western Australia	29	47	177	220	0.3	1.1	-	-
Tasmania	56	65	235	286	1.8	2.3	4.2	3.8
					Million lbs.			
Commonwealth	2049	2074	272	303	189.0	220.5	16.8	26.4

From the above table it is evident that judged from the actual number of dairy cows, New South Wales and Victoria are losing their supremacy in dairy produce, and this relative decline is emphasised by the percentages of production in the last two divisions of the Table. On the other hand dairying in Queensland shows a decided advance. Dr Griffith Taylor (1) states that the dairying industry of New South Wales was migrating /

(1) "Australia: Pysiographic and Economic" p.140.

migrating about 1913 from the Illawara district to the coastal districts north of the barren Trias sandstones of the Sydney area where land is cheaper and the rainfall heavier. Apparently this migration has continued into south-eastern Queensland where conditions are equally favourable. In actual production New South Wales (where Byrom Bay has the largest individual factory in the world) still leads in the output of butter, but the Darling Downs of Queensland now occupy the premier position in cheese-making. Queensland showed an average production in 1919-23 of 10.6 (1) million pounds, or nearly as much as New South Wales and Victoria combined. And it is in cheese particularly that exports have advanced. (Table 24).

While in New South Wales dairy farming is carried on along the coasts and extends inland to the 40-inch isohyet, in Victoria it is practised more widely. Dairy cattle are grazed on the coastal plains, but also between the highlands and the Murray river where the 25-inch isohyet divides the irrigated from the rainfall pastures. From the north-west of the state to Geelong a belt of dry country separates coastal and inland farms.

Development is marked in Western Australia where cattle farms occur along the coast from Albany to the Artesian basins round Derby and Wyndham. South Australia and Tasmania have made small progress since the pre-war period.

In all Australian pastures cattle may be left in the open throughout /

(1) Maximum output 15.2 million lbs. in 1921, falling to 7.2 in 1923.

throughout the year. Drought, their worst enemy, is now more fully provided against by means of Artesian wells than previously. Progress in the production of butter and cheese will be fostered by the "Buy Empire Goods " policy, but a stable British market can be retained only by careful preparation, regular grading, and steady supplies throughout the year.

In New Zealand the farmers tend to concentrate much more on dairy than on beef cattle. This is reflected both in the proportion of milk cows to all stock and in the classes of stock preferred. Dairy cattle comprise nearly 50 per cent of the total stock, and include pure-bred Jersey, Friesian, Ayrshire, milking Shorthorns, and Red Polls in by far the largest numbers, and dairying heifers with a predominating strain of these.

North Island - principally the districts of Wellington, Auckland, North Auckland, and Taranaki, contains 80 per cent of all cattle, and over 75 per cent of the dairy cows. Of the 20 per cent in South Island Canterbury, Southland and Otago graze most, leaving less than 5 per cent for the remainder of the Island.

Although New Zealand suffers like Australia by her distance from the British market and cannot yet export chilled beef thereto, the Dominion has made rapid progress in dairying. By careful selection after testing, to secure the most profitable stock, by liberal feeding, including the provision of fodder crops, (1) to maintain a steady flow of milk, and by the use of milking/

(1) The climate of New Zealand is much more favourable for sown grasses than that of Australia. Area under (artificial) sown grasses - New Zealand(1913)14.5 million acres,(1923) 16.5; Australia(1913) 3.0, (1923) 4.3.

milking machines to reduce the cost of labour the dairy farmer is laying the firmest foundations of successful trade. On its part the government provides for inspection and grading, as well as for the registration of co-operative dairy companies. Butter factories are most numerous in Auckland, the "butter province". Taranaki comes second to Hawke's Bay in number of cheese factories, but it is by far the most important cheese-exporting province.

In addition to increasing competition from Argentina New Zealand will again have to face competition from Siberia in the butter market. At present the Dominion ships most of her butter between November and February "with the result that the New Zealand butter price falls to as much as 30s. per cwt. below the price of Danish butter."(1) New Zealand farmers and traders have still much to learn from Denmark in how to provide a steady all-year round supply of butter for the British market, though the quality of the commodity has attained a high level.

Farm/

(1) Survey of Overseas Markets. p.364. Since the farmer cannot regulate demand in the British market for his butter he attempts through the Dairy Exports Control Board to regulate the distribution by the cold storage of the supply in London till prices rise. Such state speculation is in itself harmful to the regulation of the product, and can never overcome the lack of enterprise that precludes the benefit of regular all-year round supplies.

Farm Stock in Canada

Table 21.

	Cattle				Sheep	
	Total		Milk Cows			
	1911-13	1919-23	1911-13	1919-23	1911-13	1919-23
	thousands		per cent of total		thousands	
Pr.Edward I.	116	135	43	37	88	113
Nov a Scotia	286	346	45	43	218	315
Ne w Brunswick	220	302	50	46	147	225
Quebec	145 3	2019	52	50	620	1092
Ontario	2507	2875	43	42	709	1041
Manitoba	420	758	36	32	40	132
Saskatchewan	648	1481	29	27	115	165
Alberta	753	1593	21	23	149	354
Brit.Columbia	137	257	26	23	42	49
Dominion	6540	9766	40	37	2129	3487

Canada is one of the few parts of the Empire from which live cattle may be imported into Great Britain either to be killed at the ports (fat cattle), or fattened on British pastures before slaughter ("store" cattle). In 1909 Canada supplied about 114,000 live cattle; in 1913 only 1,800. The trade began again in 1921, and imports rose from 18,475 in 1922 to 56,672 in 1923, and almost to 77,000 in 1924. Further development of this trade depends upon increase in numbers and improvements in quality of Canadian herds.

The Irish Free State and the Union of South Africa are the other parts of the Empire from which live animals may be imported. At present the Irish Free State supplies almost 90 per cent of such imports, while the Union of South Africa is only thinking seriously about it. Yet the demand for fresh meat is such that it fetches very high prices compared with chilled meat.(1) "We feel that any steps towards increasing the imports of live cattle from the Empire will go some way towards reducing the

Home/ (1) Irish, Canadian and U.S.A.(port killed) realised 91s. per cwt.in 1924(Cmd.2499.p.11).

Home Country's dependence on foreign sources of supply for its beef."[1]

Canadian supplies of frozen beef and veal in 1924 were valued at one-tenth of British imports from Australia; her supplies of chilled beef were negligible.

From Table (24) it is evident that dairy farming[2] is extending in Canada where mixed farming is becoming a general rule even in the Prairie provinces. Dairying industries are most numerous in Quebec and Ontario which contain the largest numbers of dairy cattle and almost 90 per cent of the 3,000 butter and cheese factories in Canada. In the accompanying tables these details are further exemplified, but it must be

Table 22

Butter and Cheese Factories

	No. of Establishments		Output Million lbs.	
			Butter	Cheese
	1910	1923	1923	
Pr.Edward I.	45	33	1.5	1.8
Nova Scotia	18	27	3.6	0.03
New Brunswick	42	32	1.2	0.8
Quebec	2143	1660	59.2	46.9
Ontario	1254	1014	54.9	99.6
Manitoba	42	57	10.7	0.2
Saskatchewan	27	66	10.9	0.1
Alberta	56	84	17.9	1.9
Brit.Columbia	9	31	3.0	0.3
Dominion	3625	3007	162.8	151.6

remembered that there is considerable production of home-made butter and cheese[3] in addition to that produced in the factories.

Canada's /

(1) Ibid p.12
(2) So far, at least, as butter exports are concerned.
(3) In 1923 dairy butter 100 million lbs.: home-made cheese 535,000 lbs.

Canada's exports of dairy products to the United Kingdom are figured in Table (24). Such exports come naturally from the eastern ports, and especially by the St.Lawrence. Canada differs from Australia in the coldness of her winters and all stock must be stall-fed throughout the winter in the eastern provinces, as well as over the greater part of the prairies. Advanced methods are again the key to increase of trade; the Empire produce of Canada should always find a ready market in the United ~~States~~ Kingdom. In this trade as in grain the growing and increasingly industrialised population of the United States will compete more and more severely for the Canadian surplus, hence it would be well to establish a regular market in the United Kingdom for Canadian supplies.

Geographically the Union of South Africa is well situated for meat exports to the United Kingdom. Her large herds are beyond the needs of local markets, but much greater improvements in her herds (which have been selected for draught rather than for meat purposes) must prepare the way for greater exports. Live stock are so largely in demand in British markets that South Africa should endeavour to supply animals; a trial shipment from Rhodesia realised good prices in the British markets. With reduced cost of transportation to the ports and over the ocean, important developments would doubtless follow.

Expansions in ranching are possible especially in the northern Transvaal districts of Waterberg, Zoutpansberg, Pietersburg/

Pietersburg, and Lydenburg, where the bush veld yields good winter grazing, but where summer grazing requires study. At present cattle are most numerous in the eastern Transvaal, the high veld of the Orange Free State, Natal, and the eastern coastal area of the Cape Province. On these ranches Afrikander cows, crossed with pure-bred Shorthorn, Angus, Sussex, Hereford, or Devon breeds, appear to yield suitable stock.

During the War years exports of meat were large, but the low prices ruling since 1921 have led farmers to relinquish the trade.(1) There is ample provision for dealing with animal products at the chief centres and ports; apparently economies on the ranches and heavier cattle are required to stabilise the trade which should not require the bounty granted by the Act of 1923.

Uncertain rainfall and droughts throw the principal dairying industry on to irrigated farms. At present dairy farming is almost/

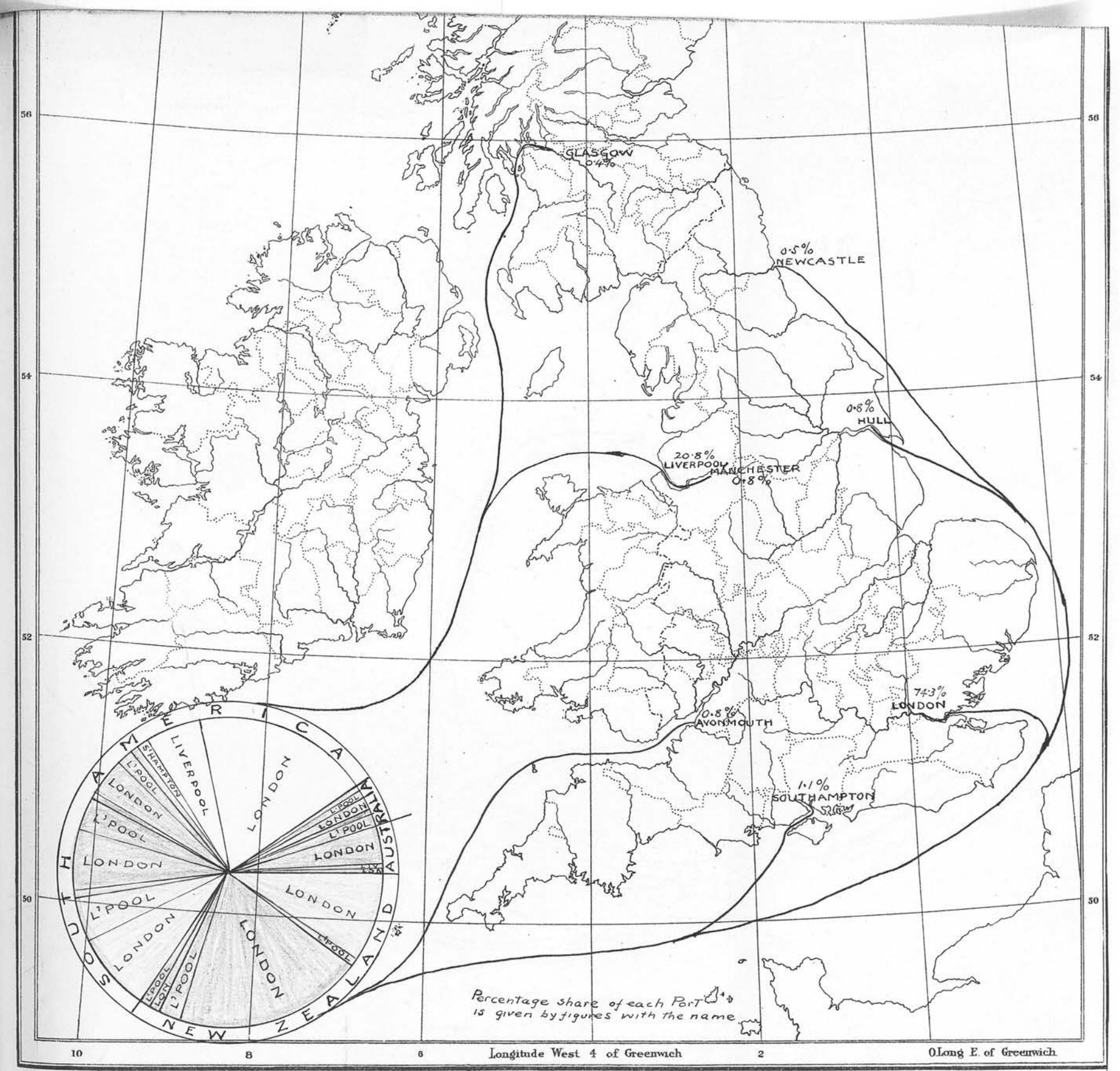
(1) Exports of Meat

	1000 lbs.	Declared value per 100 lbs.		1000 lbs.	Declared value per 100 lbs.
1913	121.3	£2: 12: 1	1921	3,395.5	£2: 14: 6
1916	5,971.7	1: 15: 6	1923	615.7	0: 16: 8
1919	46,363.2	2: 9: 1			

almost undeveloped in South Africa. It is true that natural conditions are not so favourable as in New Zealand, but there are factors that must tend to make such an industry on a large scale particularly profitable to dairy farmers. Proximity to the British market which is insatiable for butter; a regular service of steamers with refrigerating apparatus; a well-developed railway system in close connection with dairying districts; cheap coloured and "poor white" labour in abundance; organised marketing facilities; and capital for co-operative factories; - these make the establishment of a large industry possible and guarantee its success so long as the quality of the produce is maintained. "I have", says the author of an official report, "had exceptional opportunities of seeing what can be produced, and I am of opinion that there are splendid opportunities for enterprising settlers with a knowledge of dairying."(1) Ostrich farming on irrigated land is a speculative occupation, dependent on the vagaries of fashion, while under a system of stall-feeding, cattle would yield steady and profitable results.(2) South African Friesland cows are reputed rich as milk producers, imported Red Polls adapt themselves well to hard living, and Ayrshires and Jerseys have been introduced. In the post-war period the Union has reversed/

(1) Report on the Economic Conditions in South Africa, July 1924 (Dept. of Overseas Trade) p.22.

(2) "It is no exaggeration to say that these South African irrigated lands, with their prolific production of lucerne and root crops under the system of stall feeding, will carry as much as two cows to the acre." Ibid. p.21.



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MEAT IMPORTS BY PORTS, 1924.

(Based on Weddel's "Review of the Frozen Meat Trade, 1924").

reversed the pre-war conditions by producing sufficient butter and cheese for her requirements; in the future large exports should be possible, not only from the Cape Province, but from the northern Transvaal, the Orange Free State, and Natal.

"Nigeria, East Africa, and possibly British Guiana are the only other sources of beef supply within the Empire which might become important, but they are still in a preliminary stage of stocking and the possibility of catering for the United Kingdom market has not yet been seriously considered." (1)

Altogether the share of the Empire in British imports of live stock for food and in beef should be considerably augmented. But as the foregoing account of the meat industry shows there are factors that tend to delay improved deliveries. To mitigate these the Empire looks for improved freezing processes in order that the quality and appearance of the meat may be preserved; for improved methods of chilling so that Empire beef might compete with South American supplies; (2) and for more rapid transport to make the supply of such meat more secure.

Animal Products 1924 (3) Table 23

Description	Home-Production	Imports from Empire Countries	Imports from Foreign Countries	Total Supplies
	Per cent	Per cent	Per cent	Quantity (thousands)
Meat-				
Beef and Veal	44.4	12.2	43.4	1,349 tons
Mutton and Lamb	41.0	33.0	26.0	458 "
Pig Meat	34.0	14.5	51.5	865 "
Butter	17.0 (4)	37.0	46.0	6,377 cwts. (4)
Cheese	31.0 (4)	60.0	9.0	4,186 " (4)

This/

(1) Cmd.2499 (1925) p.14.

(2) The Low Temperature Research Station at Cam bridge could be better equipped and extended to prosecute such studies. (Cmd.2493 (1925) p.17).

(3) Based on Cmd. 2493 (1925) p.29. (4) Figures only approximate.

This table serves to show the small share of the United Kingdom in the provision of animal products for home consumption. There is ample opportunity for extension of pastoral industries which should supply at least half of the nation's requirements. In pastoral, as in arable, farming little has been done to stimulate production, and the dependence of Great Britain on Imperial and foreign lands must be so forced on the attention of the population that a new agrarian revolution may be brought about.

Cattle Products

(Figures are annual averages) Table 24 ~~32~~

	Australia		New Zealand		Canada		Union of South Africa	
	1909-13	1919-23	1909-13	1919-23	1908-13	1919-23	1910-13	1919-23
...le + Total No. (millions)	11.5	13.7	2.0 (1)	3.3	6.5 (1)	9.8	5.8 (1)	8.6
...- Export (thousand cwt.)	1161.6	1246.1	364.8	728.8	—	—	1.5	16.9
...to U.K. (per cent)	77.5	75.9	95.3	—	—	—	—	—
...er - Export (thousand cwt.)	692.6	678.0	346.1	785.3	48.6	127.7	2.8	11.4
...to U.K. (per cent)	89.7		88.7	94.2	75.0 (2)	51.7	—	—
...se - Export (thousand cwt.)	7.2	66.9	496.1	1353.2	1696.8 (2)	1179.5	0.2	6.1
...to U.K. (per cent)	-	-	99.4	98.9	100.0 (2)	85.6	—	—

(1) 1911 only (2) 1908-12

to British Markets,

Percentage of Empire Supplies/1923. Table 25 ~~33~~

~~xxxxxxxxxxxx~~	Beef & Veal	Mutton and Lamb	Live Animals for food	Butter	Cheese	Milk
...Brit. Empire	10.5	65.4	96.1	43.1	85.6	33.8

British Meat Imports

(Figures are percentages, but totals, except for Live Animals, are given in million cwt.)

26
Table 34

(1) Live Animals for Food

From	Bulls and Oxen		Cows and Heifers		Calves		Sheep and Lambs		Swine	
	1913	1923	1913	1923	1913	1923	1913	1923	1913	1923
	%	%	%	%	%	%	%	%	%	%
Free State	(1)	83.4	(1)	99.6	(1)	100	(1)	98.1	(1)	100
	14.8	12.2	- (3)	0.3	-	-	100	0.1	-	-
	16.7	95.6	91.1	99.9	100	100	100	98.2	-	100
(thousands)	11.8	369.4	2.6	195.5	0.3	19.6	0.5	372.5	(4)	279.0

(2) Beef

From	Fresh		Chilled		Frozen		Tinned, Canned, etc.		Salted		Extracts and Essences	
	1913	1923	1913	1923	1913	1923	1913	1923	1913	1923	1913	1923
	%	%	%	%	%	%	%	%	%	%	%	%
Free State	(1)	14.7	(1)	-	(1)	-	(1)	-	(1)	-	(1)	-
	-	-	-	0.01	0.3	1.6	0.5	0.1	1.3	-	(2)	-
lia	-	-	-	-	31.7	16.8	40.3	4.2	-	-	(2)	2.6
aland	-	-	-	-	5.9	15.2	1.4	1.0	-	-	(2)	0.3
	0.002	19.0	0.0	0.01	37.9	33.6	42.2	5.4	1.3	1.6	(2)	2.9
Mill.cwt.	0.24	0.07	5.25	7.63	4.45	5.07	0.80	0.93	0.10	0.03	(2)	0.90

(3) Veal

From	Fresh		Frozen	
	1913	1923	1913	1923
	%	%	%	%
lia	(2)	-	(2)	24.6
land	(2)	-	(2)	22.5
	(2)	-	(2)	14.3
	(2)	0.2	(2)	61.4
Mill.cwt)	(2)	0.17	(2)	0.03

(4) Mutton

om	Fresh		Frozen		Tinned or canned		Other (5)	
	1913	1923	1913	1923	1913	1923	1913	1923
	%	%	%	%	%	%	%	%
Free State	(1)	-	(1)	-	(1)	-	(1)	1.9
lia	-	-	32.1	22.3	51.2	46.8	(2)	5.8
aland	-	-	42.2	27.8	10.5	19.8	(2)	15.5
	-	-	-	-	1.3	0.9	(3)	-
	-	0.5	74.3	50.1	66.9	67.5 (7)	(2)	23.2
(million cwt)	0.13	0.17	5.20	2.93	0.09	0.03	(2)	0.06

(5) Lamb.

	Fresh		Frozen		Tinned or canned		Other (5)	
	1913	1923	1913	1923	1913	1923	1913	1923
	%	%	%	%	%	%	%	%
lia	(6)	-	(6)	21.9	(6)	-	(6)	8.5
aland	(6)	-	(6)	52.2	(6)	-	(6)	11.3
	(4)	1.2	(6)	74.1	(6)	49.3	(6)	20.9
illion cwt.)	(6)	0.01	(6)	2.83	(6)	(8)	(6)	0.01

(6) Pig Products

	Bacon		Hams		Pork							
					Fresh		Frozen		Salted		Other (5)	
	1913	1923	1913	1923	1913	1923	1913	1923	1913	1923	1913	1923
	%	%	%	%	%	%	%	%	%	%	%	%
ree State	(1)	4.1	(1)	0.3	(1)	37.9	(1)	-	(1)	-	(1)	17.2
	5.0	10.7	10.5	6.5	-	-	2.4	5.3	0.8	3.8	(2)	3.2
land	-	-	-	-	-	-	14.3	8.2	-	-	(2)	-
	5.1	14.8	10.5	6.8	0.03	37.9	16.7	13.5	0.8	4.2	(2)	20.5
ill.cwt)	4.86	7.79	0.85	1.75	0.48	0.61	0.02	0.40	0.24	0.07	(2)	0.20

sh Free State dates from 1922. (2) Included elsewhere (Veal under ef). (3) From Channel Ids. (4) Included in Animals for eeding in 1913. (5) Hearts, Livers, Kidneys, etc.
) Included under Mutton 1913. (7) Falkland Ids.3.9.
) 295 cwts.

Sheep and their Products

(Figures are annual averages)

Table 27

	Australia		New Zealand		Union of South Africa	
	1909-13	1919-23	1909-13	1919-23	1909-13	1919-23
Sheep - Total No. (millions)	89.0	78.9	23.9	23.7	25.8 (3)	26.1 (3)
Wool - Total Prodn. (million lbs.)	705.1	628.1	198.5	235.5	165.9	133.9
" - exports in the grease (in million lbs.)	556.8	547.5	159.4	163.5	143.8	167.6
" - per cent to U.K.	38.1	59.6	90.2 (1)	91.7 (1)	58.1 (1)	41.5 (5)
" - exports, scoured and washed (in million lbs.)	70.3	97.9	35.0	64.3	4.4	14.2
" - per cent to U.K.	45.5	73.0	(2)	(2)	(2)	40.7 (5)
Mutton and Lamb - Exports (in million lbs.)	151.4	117.6	109.4	322.3	0.1	0.2 (4)
" per cent U.K.	94.1	94.7	98.1 (6)(7)	93.2 (6)	?	?

(1) per cent of all wools exported.

(2) included above. (3) Woolled sheep only.

(4) 1919-21.

(5) By value.

(6) Frozen meat.

(7) 1913 only.

British Imports of Raw Wool, Frozen Mutton and Lamb. Table 28

	Raw Wool		Frozen Mutton and Lamb	
	1909-13	1919-23	1910-14	1920-24
	per cent	per cent	per cent	per cent
Australia	37.3	47.2	25.8	17.6
New Zealand	22.5	22.9	41.3	48.6
South Africa	14.3	12.3	-	-
British India	6.8	5.4	-	-
Falkland Ids.	0.5	0.4	-	-
Empire	81.5	88.4	67.1	66.2
	centals	centals	cwt.	cwt.
Total (Millions)	8.05	9.09	5.30	5.97
	per cent	per cent	per cent	per cent
Re-exports	41.6	34.9	0.2	1.5

When examination of sheep products is undertaken the position of the Empire as a source of supply for the United Kingdom is seen to be very important. Sheep rearing is admirably suited to the drier and poorer pastures of the temperate parts of Australia and South Africa, as well as to large stretches of New Zealand and the unproductive uplands and drier mountain slopes of India and Canada.

Number of Sheep in the British Empire Table 29

	1913	1923		1913	1923
	millions			millions	
Australia	85.1	78.8	Great Britain	23.9	20.6
Union of S.Africa	35.7	31.4	Irish Free State	-	3.0
New Zealand	24.8	23.1	Canada	2.1	2.8
British India	23.1	22.1			

Out of a total of nearly 500 million sheep enumerated for 36 countries in 1923 or the nearest year (1) those parts of the British Empire detailed above had over 180 million or almost 38 per cent.

Percentage of Distribution of Sheep in the Empire Table 30

	Proportion of Total Sheep in each Dominion		Weight of Wool per sheep shorn	Sheep per sq.mile.	
	1919[3]	1923	1919-23	1913	1923
	per cent	per cent	lbs.	number	
Australia					
New South Wales	46.7	46.7	7.16	128.3	112.2
Victoria	14.2	13.9	6.17	137.8	133.9
Queensland	25.6	21.0	6.90	32.5	26.3
South Australia	6.0	8.2	7.63	13.3	16.6
Western Australia	5.2	8.2	5.91	4.5	6.8
Tasmania	2.0	1.9	5.45	66.6	59.4
Northern Territory	0.1	0.0	-	0.1	0.01
Federal Territory	0.2	0.1	-	163.2	147.9
New Zealand -					
North Island	54.5	55.4	7.48	297.9	290.3
South Island	45.5	44.6		187.9	174.7
Union of South Africa				64.8①	66.5
Cape of Good Hope	47.3	54.6	-	61.9①	65.6
Natal	5.9	5.0	-	43.0①	45.5
Transvaal	13.4	11.0	-	30.9①	31.7
Orange Free State	33.4	29.4	-	170.4①	164.1

① 1911

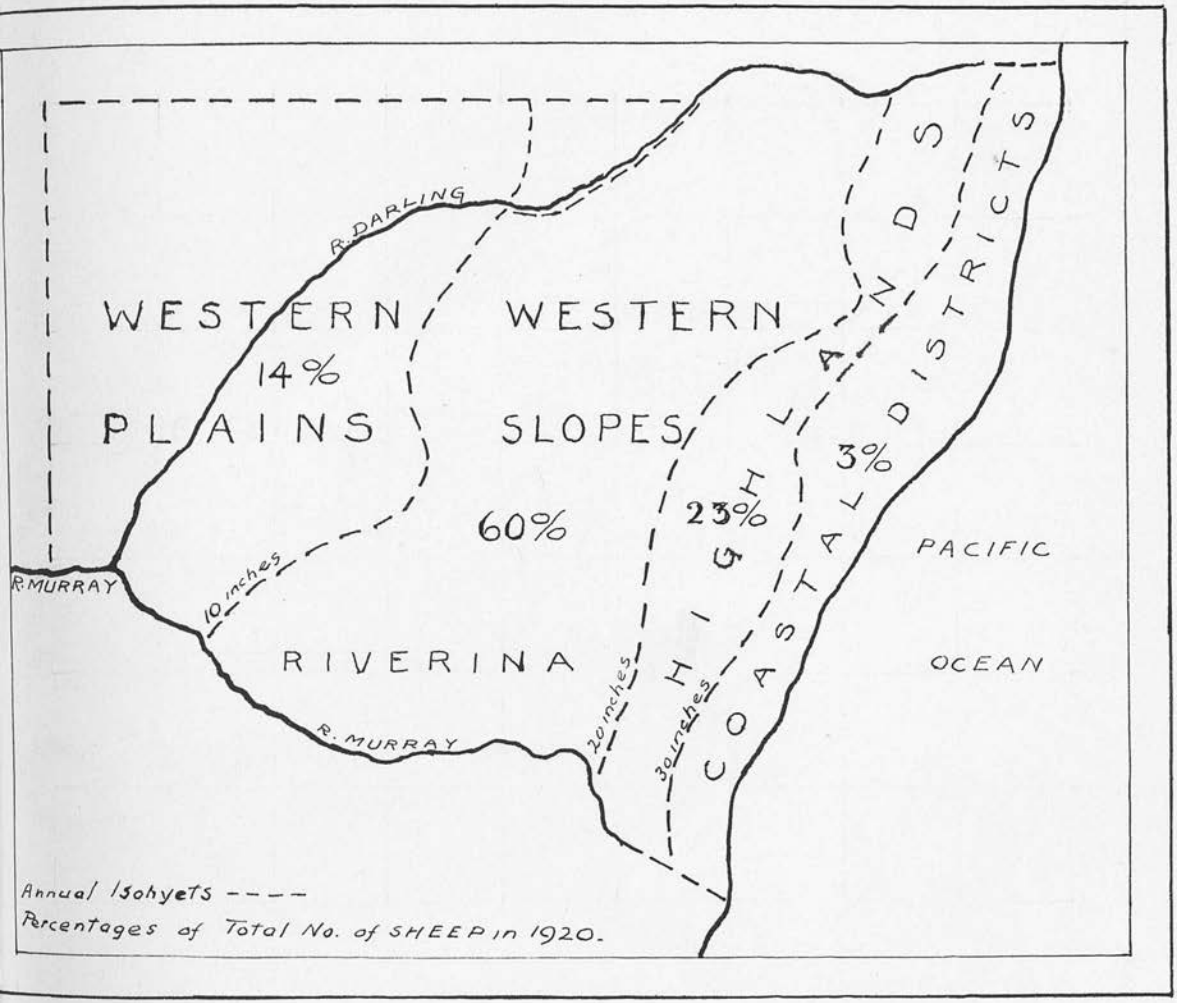
So far as percentage of distribution indicates the three eastern states of the mainland of Australia are the most important areas of sheep-rearing, but New South Wales, with nearly half of the total number of sheep in the continent is the pre dominant land of sheep farming.

(1) New Zealand Official Year Book 1925 p.425.

Imperial Share in World's Production of Wool — Table 31

Part of British Empire	1909-13	1923
	per cent	per cent
United Kingdom	5.2	4.7
Australia	27.3	22.5
New Zealand	7.7	8.3
South Africa	6.4	8.5
Canada	0.4	0.7
Total	47.0	44.7
World Total (million lbs.)	2,587.2	2,180.6

There is a world's shortage of wool, and flocks cannot be increased rapidly enough to meet requirements. During the War large stocks of wool accumulated in the southern hemisphere. These were marketed after the War by the British Australasian Wool Realisation Association (Bawra), formed in 1921. All the "carry-over" wools of New Zealand, Falkland Islands, and South Africa, with 50 per cent of those in Australia, previously purchased by the British Government, were to be sold in such a manner as to maintain the stability of the market. The sales were successfully carried through in Britain and on the Continent, and the last of nearly 2,700,000 bales were disposed of in 1924. No world reserve stocks now exist, and the outlook of Dominion pastoralists is peculiarly bright.



SKETCH-MAP of NEW SOUTH WALES to illustrate SHEEP REARING.
(After GRIFFITH TAYLOR).

About 20 per cent of Australian sheep and lambs are slaughtered annually for home consumption (over 75 per cent) or for export after freezing. Oversea exports of live sheep are of small importance, and table (27) shows that Australia compares poorly with New Zealand in the export of frozen mutton and lamb. This is because Australia specialises in wool sheep and especially in Merinos, the carcases of which are of little value for food. Generally mutton-sheep are raised on the highland pastures or on the wetter coastal plains - they are of the Romney Marsh and Lincoln varieties or cross breeds of these with Merinos. From the accompanying tables some interesting facts of distribution in New South Wales, the most important sheep-rearing state, emerge. The greatest percentage of sheep is found in the Central Plains and Riverina country where the sheep are principally Merinos,(1) but the number absolutely, and per square mile, has diminished,- a result largely brought about by drought. Changes in the other divisions are due partly to the method of enumeration. Decrease in the total number of sheep may be studied with the other two tables which show that smaller flocks are increasing in popularity, while farms of over 20,000 acres or of under 100 acres are disappearing. Apparently farms of between 1000 and 5000 acres are as large as most sheep farmers desire. Dangers from drought, combined pastoral and agricultural/

(1) The percentage of Merino sheep fell from 85 in 1911 to 78 in 1923, but is again rising with a more favourable market for wool.

22.

(1)

32
Table #7

Sheep in New South Wales

Division of State	Total Sheep		No. per sq. mile	
	1911	1923	1911	1923
	per cent			
Coastal Belt	3.2	1.8	41.0	19.0
Tableland	19.9	21.4	220.0	178.9
Western Slopes	24.9	28.8	295.5	227.0
Central Plains and Riverina	35.7	34. 0	224.1	185.6
Western Plains	16.3	14.0	58.2	38.8
	thousands			
Whole State	44,947	34,863	144.8	112.4

(1) Based on Official Year Book of N.S.W. 1923 p.539. See accompanying map.

33
Table #8

Size of Flocks (N.S.W.)

Size of Flocks	Proportion of Total Flocks		Proportion of Total Sheep	
	1911	1923	1911	1923
	per cent	per cent	per cent	per cent
1 - 1,000	69.1	72.0	11.8	17.4
1,001 - 2,000	13.6	13.6	11.4	14.6
2,001 - 5,000	10.6	9.5	19.2	21.5
5,001 -10,000	3.3	2.9	13.4	15.5
10,001 -20,000	2.0	1.4	15.8	14.3
20,001 -50,000	1.2	0.5	19.4	11.5
50,001 -100,000	0.2	0.1	7.5	4.6
over 100,000	0.02	0.01	1.5	0.6
	Number of Flocks		Thousands	
Total	25,727	26,592	44,947.3	34,862.7

34
Table #9

Size of Sheep Farms (N.S.W.)

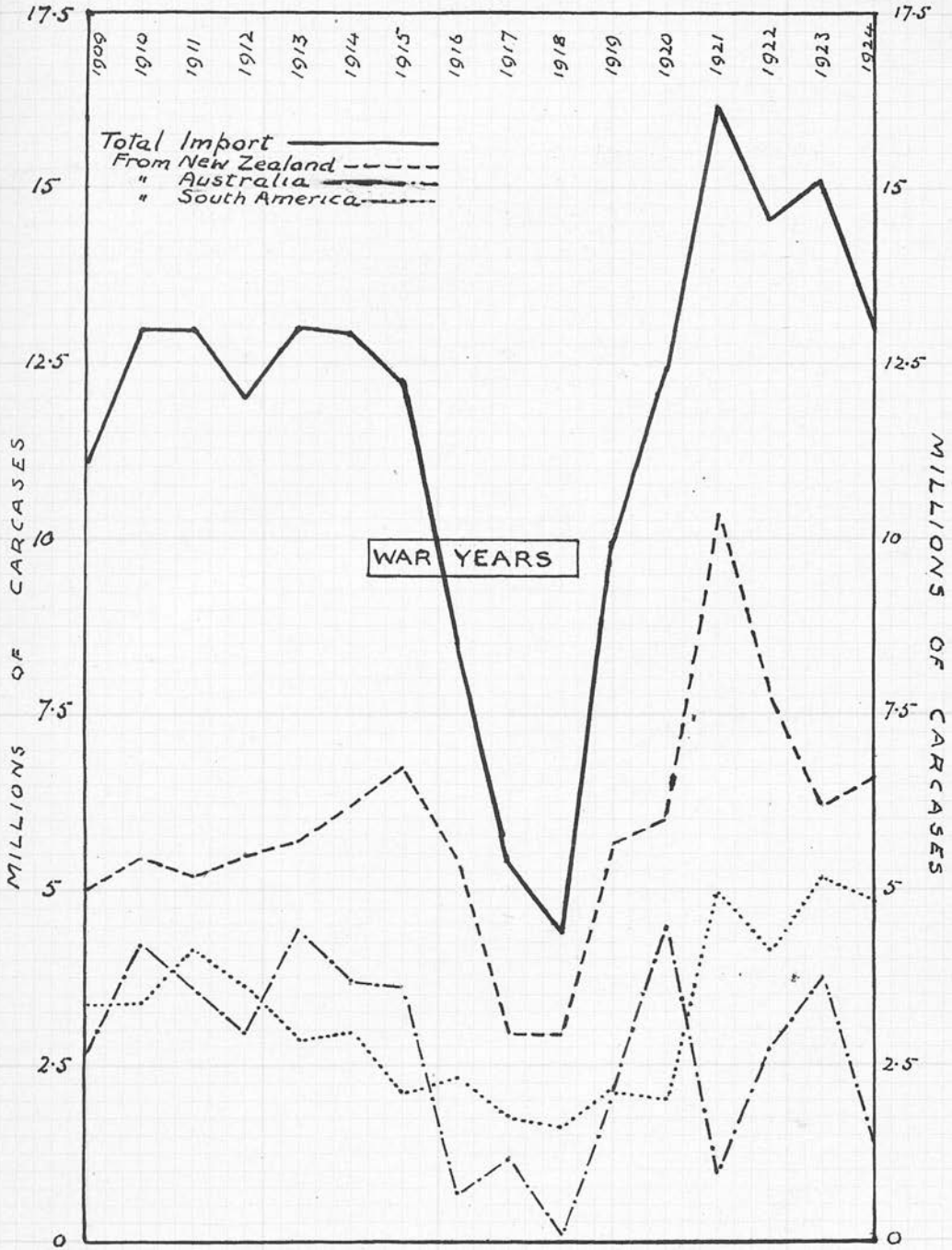
Area Groups Acres	Proportion of Total Flocks		Proportion of Total Sheep	
	1913	1923	1913	1923
	per cent		per cent	
1 and under 51	3.6	1.5	0.1	0.1
51 " " 101	2.8	2.0	0.1	0.1
101 501	21.7	20.2	2.1	2.8
501 1,001	21.9	23.4	5.1	6.3
1,001 5,001	35.0	38.6	25.4	31.0
5,001 10,001	6.4	6.7	14.2	15.0
10,001 20,001	3.1	3.3	12.4	12.4
20,001 50,001	2.1	2.4	15.5	13.0
50,001 ,100,00 1	0.8	0.7	9.3	7.0
over 100,001	0.9	0.7	15.5	12.2
Ill-defined areas	1.7	0.5	0.3	0.1
Total (Number)	25,023	26,592	39,850.2	34,862.7

agricultural pursuits, dearth of labour, and the closer settlement policy pursued since 1904 are probably the chief reasons for many of the changes indicated in the Tables, while the increasing proportion of cross-bred sheep demonstrates the success of the policy of supplying both wool and mutton to the markets, and so benefiting by the relative prices of the two commodities. Reduced numbers per square mile in the Western regions are largely explained by the period of exceptional droughts experinced since 1918-19.(1)

(1) Official Year Book of New South Wales (1923) pp.537-545.

New Zealand suffers from few of the drawbacks to sheep farming that are so harmful in the Australian Commonwealth or South African Union. In latitude the islands are situated south of Sydney, and the principal grazing lands, which correspond in position with Tasmania, lie in the rain-shadow formed by the Southern Alps, yet benefiting by the prevalent and moisture-laden Brave West Winds. Nor despite the latitude, are the temperatures high. Thus Wellington (41° 16′ S) with a mean temperature in January of 62.5°F. is about 12°F. below that of London in July; and Dunedin (45° 52′ S), with a mean temperature of 57.9°F. in January is actually cooler than Leith (July, 59.0°F; 55° 58′ N). In winter, however, the New Zealand temperatures are higher than those of Great Britain. The mean temperatures of the coldest month are - Wellington, 47.7°F; London, 38.8°F; Dunedin, 42.3°F; Leith, 38.9°F. On the whole the equable New Zealand climate resembles that of Great Britain, and is thus peculiarly favourable to the cultivation of British grasses, and the raising of British breeds of sheep and cattle. In New Zealand most sheep are grazed in the land district of Wellington, Canterbury, Gisborne, Hawke's Bay, Otago and Southland, - all on the drier eastern lowlands and slopes.

As a source of mutton and lamb for the British market New Zealand stands first, and the Dominion is also a supply market for wool. Merino sheep were the first class depastured and they still thrive in the hilly and down country of the South /



IMPORTS of FROZEN MUTTON and LAMB
into the UNITED KINGDOM, 1909-1924
(In millions of carcases).

(Based on Weddel's "Review of the Frozen Meat Trade, 1924").

ince high prices are anticipated for some years, and the increase f her flocks will involve the placing of larger supplies of utton and lamb on the market. Argentina has also an advantage n freight rates, owing to her proximity to the United Kingdom arket."(1)

Freezing does not impair the quality of mutton and lamb to he same extent as in beef, so that supplies may be evenly distributed throughout the year. Australia and South Africa must aim to secure high quality of product such as New Zealand(2) has achieved, in order to market profitably the mutton they are undoubtedly capable of producing. Regularity and continuity of supply are the great desiderata for the British market and the frozen commodity favours such demands.

The Union of South Africa carries rather less than half as many sheep as Australia. By number more than half are in the Cape Province, less than one-third in the Orange Free State; by density the Orange Free State grazes the largest number (Table 30) As in Australia sheep are raised for wool rather than for mutton- a response to similar climatic conditions (See sketch-map, Fig. 40 p. 231); but again as in the Commonwealth more interest is being taken in the marketing of frozen mutton and lamb. Roughly the price of home-fed mutton and lamb in South Africa was one penny per pound higher in 1923 (9.3d) than in 1913 (8.3), partly a result of increased/

(1) Survey of Overseas Markets. p. 363.

(2) Over both parts of the Empire specified New Zealand has the great advantage of numerous ports contiguous to the local sources of supply. See p. 228

increased supplies due to post-war rise of prices accompanied by vanishing competitive imports.(1)

In wool production South Africa holds the second place among Empire lands, and the fourth among world sheep countries, yielding (1923) 7 per cent of the World's wool crop, against 18.8 for Australia. Since the War, during which the United States purchased largely from the Union, the quality of South African wool has been improved considerably and the establishment of Wool Growers' Associations is leading to the selection of better fleeced sheep as well as to better conditions of grading and marketing. Accumulated stocks of the war period have been exhausted by sales on the same plan as in Australia(2) and more stable prices foreshadow increased prosperity for the Union.

In the Angora wool trade Turkey alone competes with South Africa. Exports from the Union, most largely(3) through Port Elizabeth, depend almost entirely upon the demand at Bradford which in turn buys according to continental demands for mohair yarn. Thus the trade varies and is speculative. Reduction in numbers of goats is explained largely by the severe droughts /

Table 35

Mohair

	No. of Goats (Angora)	Mohair produced and exported
	Millions	Million lbs.
1911-13	4.3	20.6
1919-23	2.3	8.2 (4)

(1) Average Annual Imports to Union of (a) Frozen Mutton - 1910-14, 2,356,000 lbs; 1920-23, 576,000 lbs.
(b) Frozen Beef 1910-14, 5,987,000 lbs; 1920-23, 52,000 lbs

(2) See p. 62
(3) 87.3 per cent by weight in 1923.
(4) 9.5 mill. lbs. in 1923.

droughts of the period 1913-16 which were especially destructive in the Angora belt of the Cape Province where most of the goats are raised.(1)

Despite her wide extent of apparently suitable country Canada carries very few sheep. This is largely due, it may be supposed, to the severity of Canadian winters, especially in the interior where sheep could not find food. Flocks do not thrive under indoor conditions, as cattle do, and thus, apart from the feeding, it is doubtful if sheep would prove remunerative over the prairie. In the following table distribution per sq.mile and per thousand of population is shown. It must be remembered that coastal conditions especially in the west, and the Chinook regions of Alberta, are not so extreme as these of the Prairie and Gulf Provinces. During the post-

Table 36

Sheep in Canada 1923

	No. of sheep			No. of sheep	
	Per sq. mile	Per 1000 of Pop.		Per sq. mile	Per 1000 of Pop.
Prince Edward I.	38	947	Manitoba	0.4	153
Nova Scotia	12	494	Saskatchewan	0.6	161
New Brunswick	6	407	Alberta	1.	406
Quebec	1	348	Brit.Columbia	0.2	102
Ontario	2	309	Canada	1	313

war period the number of sheep has decreased year by year and the wool crop for 1923 was less than 16 million pounds. Present conditions favour sheep farming, but Canada is evidently unattracted /

(1) 83.3 per cent in 1913; 91.3 in 1923.

unattract ed by an occupation for which population is at present unavailable, and which has not the organised markets that deal with cattle and grain produce. In addition there is the fencing problem, and in the West, the danger from wolves.(1)

(1) Ency.Brit. New Vol.I, p.507.

TEA, COFFEE, AND COCOA

From the point of view of total British Imports, the three beverage bases - tea, coffee, and cocoa - occupy in the aggregate about the same percentage in value for the quinquennium 1919-23 (when they together represented 2.8 per cent of the total value) as for the pre-war lustrum 1909-13 (2.4 per cent). If the value of Class I Imports - Food, Drink, and Tobacco - are alone considered the percentage is the same for both periods, - 6.3. Of that percentage tea forms 4.7 in each quinquennium, cocoa has risen from 0.7 to 1.0 and coffee has declined from 0.9 to 0.6.

Geographically these three commodities are especially interesting in distribution. Generally speaking tea is a temperate product, coffee is tropical, and cocoa equatorial. Tea and coffee agree in demanding a wet slope of rich soil while cocoa is obtained from the low-lying equatorial forest belt. The tea and coffee shrubs, and the cocoa or cacao tree are planted for commercial reasons as near to the ocean as possible, while for collecting purposes they are allowed to grow only so high as native labour can reach. All agree in demanding cheap, but not necessarily unskilled, labour for picking or preparation for export; the harvest of each is determined very largely by world demand, - the acreage expanding or contracting as prices rise or fall. As the three plants do not reach full bearing before the sixth year, the planter must have sufficient capital /

capital to await results, or be able to grow catch crops, and generally plants bananas or other economic trees for shade to his nursery shrubs.

British imports of these vegetable commodities are not entirely used for home consumption. The percentages retained within the United Kingdom are shown in the following table; the remainder is re-exported widely over the world, principally from London.

Table 37

Quantity imported and Percentage retained for Home Consumption

	TEA		COFFEE		COCOA	
	Average Total Import 1000 cwt.	Home Consumption per cent	Average Total Import 1000 cwt.	Home Consumption per cent	Average Total Import 1000 cwt.	Home Consumption per cent
1911-13	3,191	83.4	765.5	32.8	675.3	71.8
1922-24	4,125	86.1	695.1	45.1	1262.5	70.3

From the aspect of post-war trade it is evident that the increased imports of tea and cocoa may be attributed partly to increase of population in the United Kingdom and partly perhaps to greater per caput consumption, while the decreased imports of coffee are counterbalanced by the larger percentage retained for home consumption. In reality all three crops show a large import by quantity.

As the sources of supply of tea have remained fairly constant the production of that commodity may be briefly considered but the changed sources for coffee and cocoa demand that a fuller /

fuller account of these should be undertaken. The outstanding feature is the greatly increased consumption of cocoa, largely due, perhaps, to chocolate manufactures; the imports of this commodity have almost doubled in the post-war period.

As the geographical factors controlling the production of all three are treated in sufficient detail in text-books of Commercial Geography it has not been considered necessary to repeat such information in this summary.

TEA

38

Sources of British Imported Tea — Table 53

	Percentage of Total Imports from				Average Annual Import 1000 cwts.
	British India	Ceylon	Nyasaland	Empire	
09-13	54.2	32.0	-	86.3	3,117.3
14-18	61.9	26.7	0.1	88.8	3,367.3
19-23	59.9	27.2	0.1	87.3	4,016.7

Practically the whole of the British imports of tea are derived from the British Empire, and, as the table above indicates, India and Ceylon send us about 90 per cent of our large imports. Figures of production within the Empire serve only to accentuate the predominance of these two sources of supply.

Tea-growing in the British Empire

39

Average Annual Production (or Export) — Table 54

	1909-13 1000 cwt.	1919-23 1000 cwt.
itish India (including Native States)	2,491.3	3,006.5
ylon	1,687.6	1,606.3
ion of South Africa	39.2	31.5
asaland Prot.	1.0	5.9
uritius	0.8	0.4
Islands	9.5	9.2

Indian tea is produced almost entirely in the north of the sub-continent where six-sevenths of the acreage under the crop are under plantation, principally in Assam. Thus of the 710,300 acres under tea in 1923 615,400 acres were in northern India including 411,800 in Assam. These statistics leave less than 95,000 acres for southern India, while Burma's share has almost disappeared. The crop from this acreage was almost 375,500,000 pounds of tea. Of this crop over 90 per cent was exported, 80 per cent being consigned to the United Kingdom.

Of the teas of northern India the Darjeeling variety realises a high price because of its delicate flavour; Assam tea is of a thick liquoring nature, giving blend strength, and body when mixed with the poorer product of Duars; the teas of Cachar and Sylhet are of poor quality, many of the plantations being laid out on pure peat lands (bheils) where drainage is extremely difficult, but where production per acre is very high.

While the plantations of northern India are laid out along the lower well-watered slopes of the Himalayas at elevations generally under3,500 feet, those of southern India in the Nilgiri Hills and elsewhere, are found, because of the low latitude, to produce best at elevations between 5000 and 6000 feet above sea-level. Plantations in southern India are increasing in number, new areas having been marked out for planting /

planting despite a shortage of labour that is felt there. Labour troubles have been most acute in the northern tea gardens.

In Ceylon, where labour is plentiful, no land is available for the development of new areas. There the high quality of the crop keeps demand constant. Exports almost touched 200 million pounds (avoir.) in 1924, the British share being about 65 per cent.

Excellent tea is grown on the lower slopes of the south-east of the Mlanje mountain group in Nyasaland from the Ruo River north to Chitakali (20 miles) beyond which rainfall is insufficient.(1) "Unfortunately, tea is not one of the principal crops of the Protectorate and....an increased prosperity among the planters does not have the widespread beneficial effect that follows a similar activity in the (more widespread) tobacco industry."(2)

With the constantly widening market for tea and the consequently improved prices for the commodity, it is certain that the area under the crop will increase, and that the additional production will be readily absorbed. In India, the greatest exporting country, a marked improvement in political conditions would, it may be hoped, be reflected in the labour supply, attracted by enhanced pay.

British peoples within and without the Empire are, as in pre-war years, the world's heaviest consumers, Australasia holding/

(1) Handbook of Nyasaland 1922 p.90.
(2) Col.Rep.No.1204,(1923) p.6.

holding the first place for per caput consumption, but, partly as a result of the War, during which abstention from intoxicating liquors was practised, and European allied troops became more accustomed to the beverage, and partly as a consequence of prohibition in various lands, the demand for tea among foreign peoples has grown apace. Hence though the Russian market has collapsed, the surplus caused thereby has been readily absorbed.

Tea production in other parts of the Empire is mainly of local importance, as it is consumed within a relatively small radius of the growing centres. Further extension of cultivation (e.g. in Uganda, Kenya and Tanganyika) depends largely on the relative values of competing crops; further expansion upon the supply of cheap labour.

C O F F E E

Sources of British Imported Coffee. Table 55 40

	Percentage of Total Imports from				Average Annual Import 1000 cwts.
	British India	British West Indies	Kenya Colony ①	Empire	
1909-13	10.8	1.0	0.4	13.5	810.2
1914-18	6.4	2.5	1.1	12.8	967.5
1919-23	10.9	1.3	15.6 ②	29.8	775.1

① formerly British East Africa Prot.
② British East Africa

British imports of coffee, like those of tea, show a considerable uniformity of quantity from period to period. In the summary table given above it is interesting to note that the Empire is supplying an increasingly large proportion of our import, and that this is due to a rapid expansion of East African /

African production. This is emphasised in the table below where the average annual crops (in some cases exports only) are shown.

Coffee-growing in the Empire
Average Annual Production — Table 56

	1909-13 cwt.	1919-23 cwt.
British India (incl. Native States)	265,435	225,600
Jamaica (1)	73,774	63,736
Federated Malay States (1)	13,916	8,941
Uganda (1)	3,880	41,205 (2)
Kenya Colony	2,658	78,295 (2)
Nyasaland	4,069	1,033
Ceylon (1)	510	258

(2) average of years 1920-23

(1) Domestic exports are given as production figures are not available. (Total production for F.M.S. 1922-23)

In India where some 3,000 plantations cover nearly 230,000 acres, more than half of the area under coffee is in the native state of Mysore, the remainder being in the British provinces of Coorg and (24 per cent) and Madras (22), and the native states of Cochin and Travancore (2). Mysore has the rich valleys of the Nilgiri Hills rising above its plateau surface while Coorg lies among the Western Ghats between Mysore and the sea. In both states rainfall is so abundant as to favour the spread of leaf disease in the coffee plant which is now most successfully cultivated in the relatively drier parts. (1) In Madras plantations are laid out in the Eastern Ghats. The variety/

(1) "The Madras Presidency" (Thurston). P. 214.

variety grown is the fine Coffea arabica. Reports indicate that, owing largely to the fall in the price of coffee, caused by the great quantities of cheap Brazilian produce in the market coffee is in some parts giving place to tea, and in lower plantations to rubber.

Jamaica produces a variety of grades of coffee among which the famous Blue Mountain variety - grown at elevations of from 3,000 to 4,500 feet, and considered the finest the world produces, commands the highest prices in the market. Following a period of depression, values rose during the War, and prosperity has returned. Enhanced prices are expected to lead to the opening up of new areas in British Guiana, where labour shortage has hindered development.

Coffee plantations were largely abandoned in the Federated Malay States, probably because of the great expansion of rubber-growing, but production has again increased since the War.

In Uganda and Kenya Colony European planters and natives alike have brought about the extension of coffee-growing that has produced the greatly increased production in East Africa. From about 170 plantations Uganda exported almost 41,000 cwt. in 1923, while the acreage under native cultivation rose to 133 and yielded 66,000 lbs. of cherry for the pulping stations. Even more rapid developments have taken place in Kenya whence not/

~~(1) "The Madras Presidency" (Thurston) p.214.~~

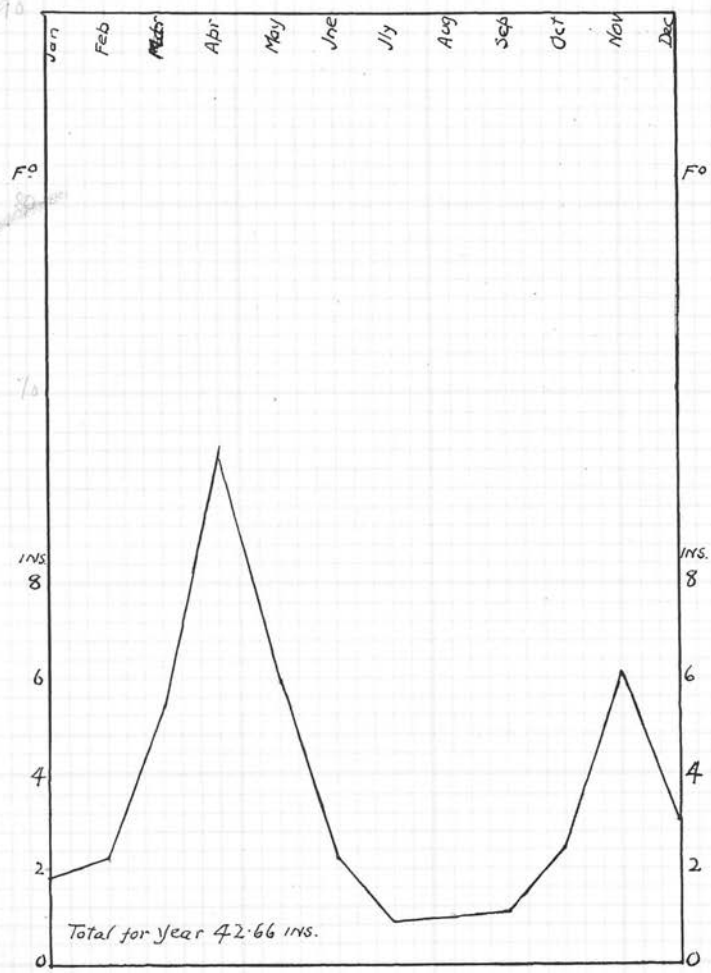
not far short of 140,000 cwt. were exported in 1923. The value of exported coffee from Uganda and Kenya has multiplied twelve times since 1913.

In Uganda coffee comes second only to cotton. It is grown chiefly near the white settlements in Toro and Bunyoro. On the west slopes of Mt.Elgon the Bagishu ~~tribe~~ tribe has commenced to cultivate C.arabica, and the result will be watched with interest.

Tanganyika Territory is suited in several parts for coffee growing. While natives grow mainly the hardy and high-yielding, but poor quality, C.robusta, especially in Bukoba district, those of the Kilimanjaro district are raising C.arabica. Indigenous coffees are marketed principally in North Africa, but are also shipped to Holland for central Europe. Arusha coffee is of very high quality and fetched £10 more per ton than Kenya coffee in 1923-24; the area of this Arabian crop could be largely increased. C.arabica is also raised on the Usambara plateau, and altogether over 5,250 tons were exported in 1924. The natives of Kilimanjaro district have formed a Native Planters' Association to secure better crops and more thorough preparation for market. Coffee is grown by natives in Rungwe, Tanga, and Moshi districts.

Kenya coffee is grown in several districts of the Colony the acreage being shown in the following table -

Coffee/



KYAMBU (Kenya Colony).

Meteorological Data for Coffee Plantation in KENYA COLONY.

figures for Temp. not available from Meteorological Reports of Kenya Govt.

Fig. 15.

Coffee Districts, 1923. (1) Table 42

District	Acres	Altitude in feet	District	Acres	Altitude in feet
Fort Hall	6,746	4,500	Kikuyu	24,104	5,500
Machakos	551	4,500	Trans Nzoia	5,828	5,000-6000
Voi (Teita Hills)	164	4,500	Nandi and Kavirondo North	998	5,500-6000
Lumbwa and Kisumu	7,746	4,000-5,500	Nakuru	774	6000
Nyeri	2,041	5,000	Uasin Gishu	2,769	6000

From the table several interesting points may be noted. In the first place the height above sea-level of the plantations is somewhat remarkable, varying from 4,500 to 6,000 feet. Within these altitudes the lower plantations produce the heavier yield but the quality is ~~lower~~ inferior; towards the upper level the yield diminishes but the quality improves. Nairobi coffee is valued in London only a little lower than that of Mysore and Coorg, (2) and its strongly acid flavour, no less than its high quality, brings it into demand for blending with the poorer and cheaper Santos output.

A second point clarly indicated in the table is the value of location for marketing the crop. This is exhibited by the figures for Kikuyu which contains about half of the total area under coffee. Kikuyu is near Nairobi and the railway, useful labour is at hand, and the land is "proved" for coffee. Thus though land there is dearer, it is much in demand. The large coffee area of Kyambu, for which a graph of rainfall has been prepared/

(1) Figures from Kenya Handbook, British Empire Exhibition.
(2) Price per cwt. in 1923 - Mysore 96s.9d; Coorg 89s.6d; Nairobi 88s.6d. Kenya and Uganda coffees are commercially classed as "Kenya".

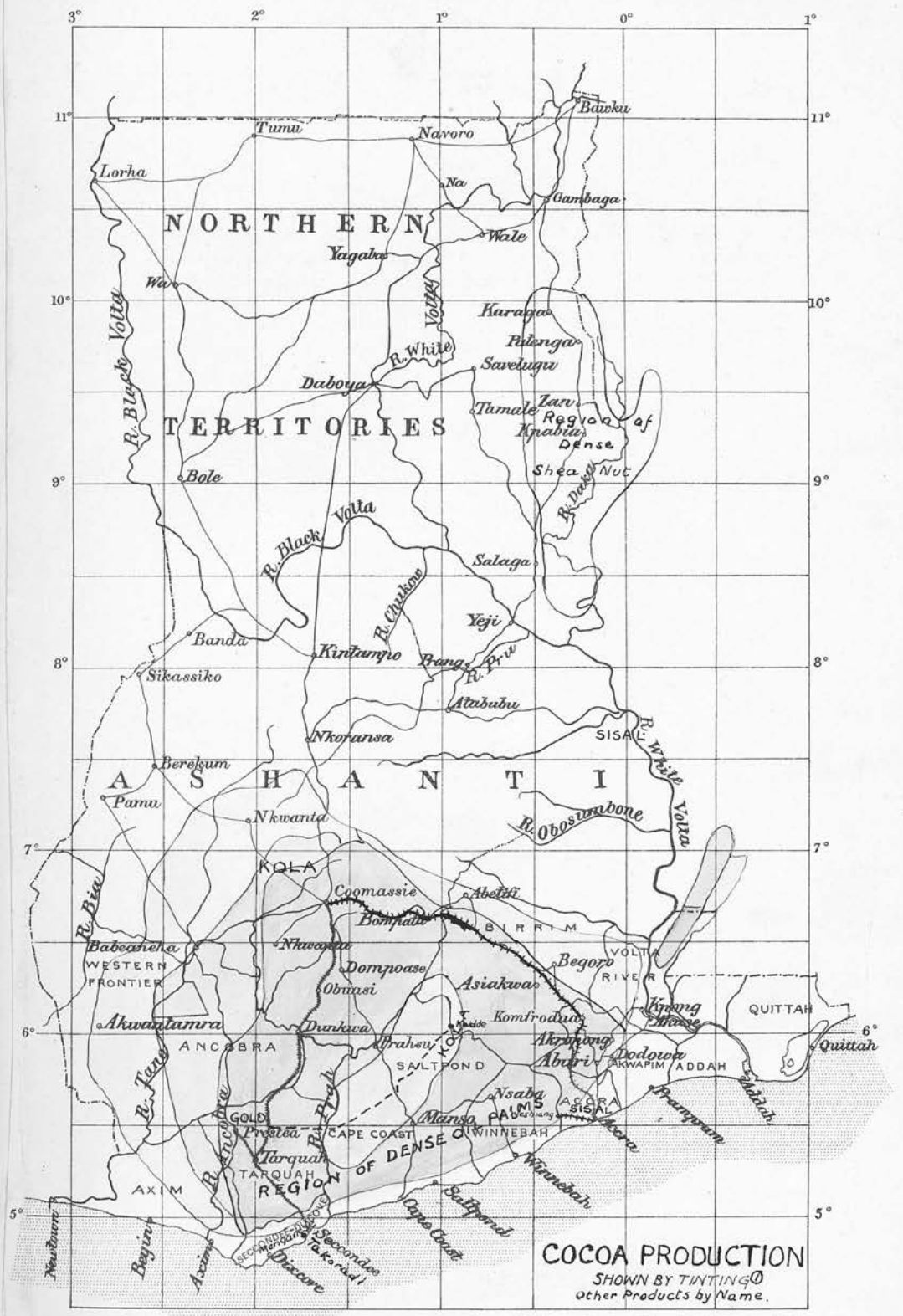
prepared, is in Kikuyu. The principal picking of coffee cherries is after the heavy rains.

Of the total area (52,250 acres) under coffee in 1923 only a little over half was in bearing, for the coffee plant is a slow-growing shrub, reaching full bearing in from six to ten years after planting, and continuing to yield for thirty years or more. With the full recovery of the European exchanges and markets, and the more complete enforcement of American Prohibition, it is unlikely that Kenya will ever find her coffee a glut on the world's markets. Labour shortage, in spite of the introduction of labour-saving machinery, is the real deterrent to increased production; extensions of transport facilities will favour larger exports from Mombasa.

Supplies from Ceylon have long since ceased to be of importance. From 1720 when the plant was introduced, until about 1880 coffee was progressively important, but the shrub, weakened by the coffee-leaf disease, was finally killed by green scale. The Liberian variety has met with only partial success.

Coffee was introduced into Nyasaland in 1894, but crop failures, due to irregular rains, the decline in prices after 1897 following heavy production in Brazil, and the ravages of the stem borer beetle, have reduced production to the level of local requirements, and coffee is now a subsidiary crop.

In general it may be noted that in coffee-plantations owned /



Ordnance Survey Office, Southampton, 1913.

MAP of GOLD COAST to show CHIEF PRODUCTS.

① (Note relation between area of largest production, deeply tinted, and railways). ----- Proposed line of Railway.

16

Fig. 11

owned by Europeans in Africa the Arabica variety is cultivated because of its flavour and market value. Native growers prefer the more easily grown C.robusta of the Congo region, C.stenophylla of Sierra Leone, or C.liberica of West Africa, which grows at lower levels than the others.

C O C O A

43

Sources of British Imported Cocoa Table 58

Percentages of Total Imports.

	British West Africa	British West Indies	Ceylon	Empire	Average Annual Import 1000 cwts.
1909-13	18.9	24.3	6.8	49.9	669.0
1914-18	51.7	14.3	2.4	70.1	1250.5
1919-23	73.6	11.7	1.1	86.7	1618.8

One of the features of Empire trade in recent years has been the rapid increase in Cacao production in British West Africa where the Gold Coast and Nigeria have now a practical monopoly of commercial production, and yield more than half of the world's supply. This is evident from the point of view of the British market in the above table, while the total exports of these two parts of the Empire indicate the great extension of cultivation and crop.

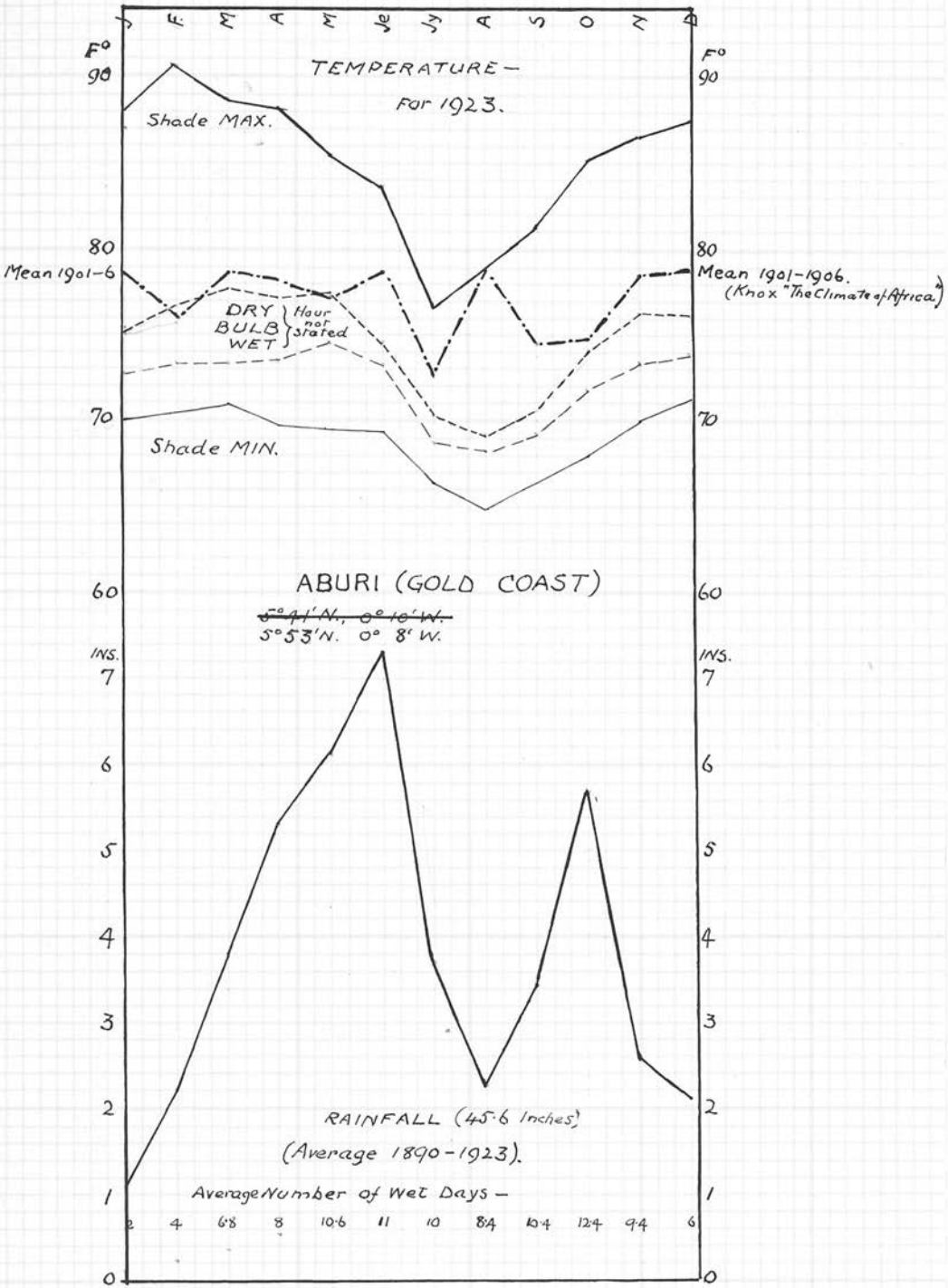
Table 59 44

	Average Annual Export			Actual export	
	1909-13	1914-18	1919-23	1913	1923
	tons	tons	tons	tons	tons
Gold Coast	34,354	71,927	158,223	50,554	197,664
Nigeria	3,317	9,732	24,967	3,621	32,817

From a few seeds carried by a native returning from Fernando Po in 1879 the cocoa industry developed in the Gold Coast. Within the last generation progress has been phenomenal. (1)

Such /

(1) See Graph of Gold Coast trade. Fig.h. h 265
(2) See accompanying map, and note how areas relatively remote from railway produce small crops. (Fig. 16)



METEOROLOGICAL DATA for COCOA-GROWING DISTRICT, GOLD COAST.

Fig. ~~11~~ 17

Such progress is due entirely to native farmers, advised by the Agricultural Department. The deep rich soils of the low coastal region (2), under the tropical climatic conditions illustrated by the graph for Aburi have favoured cultivation; but primitive methods of preparing the beans or 'nibs' for market by fermentation and drying, and careless grading, aggravated by the wetting loads suffer in surf-boats along the harbourless coast, result in a poor quality and flavour. This low-grade cocoa commands correspondingly low market prices, fetching in London 10s. to 15s. per cwt. less than that of Trinidad. It is used largely in the manufacture of chocolate.

It is imperative, if Gold Coast cocoa is to maintain its position, that better methods of preparation be employed; and the scientific study of insect pests and diseases must be steadily prosecuted. To secure the former, ocular proof of the enhanced value of improved quality is necessary to impress the natives; the ravages of Sankonuabe and the Cocoa Mosquito on the young shoots, of Big Bugs on the young pods, of various Borers, and of Leaf Beetles, as well as various fungi diseases, bear their own results, and if these are not checked a catastrophic calamity such as befell the coffee industry in Ceylon may occur.

At present only one-eighteenth of the area available for cocoa is planted, and if sufficient labour could be secured to work /

(2) Note on Mensons Rule.

work double the present area, an annual output of 300,000 tons could readily be attained. Estimates place the potential cocoa area at 24,000 square miles. Further increase of export in view of falling prices (1) will depend largely on reduced costs of transport both inland and at the coast. At present the cost per ton mile is - by head 5s. to 6s.; by lorry 2s.6d. to 3s.3d.; by rail 7½d for the first 50 miles, reduced by 1½d. for each additional 50 miles to 3d. for 200 miles. (2) It is obvious that railways alone can reduce the inland rates; the completion of Takoradi harbour will allow direct loading from the railway and save lighterage and surf boat charges. To the farmer the actual cost of production is about 2s.6d. per 60 lbs. and with the help of his family he can prepare three-quarters of a ton per annum.

Conditions in Southern Nigeria are very similar, and there too, the output is increasing so rapidly as to lead to competition with the Gold Coast. The ease with which this money crop is raised has led to the decline of cotton cultivation, (3) but, as in the Gold Coast, careful attention requires to be given to preparation for market. The Department of Agriculture has initiated an extensive project of instructional work in co-operative fermenting and drying houses, and undertaken a scheme of inspection and grading on behalf of the native cultivator who will secure better prices.

(1) In 1921 the value fell below pre-war prices - 1910-13 £22-£40 per ton; 1921 £35.15/4. Such/
(2) The Gold Coast Handbook, 1923 p.222.
(3) See p. 140.

Such phenomenal developments in West Africa have induced a state of acute depression in the West Indies. Although the world's consumption of cocoa increased from 252,400 metric tons in 1912 to 431,300 metric tons in 1923 it has not kept pace with production. This has been felt most in Trinidad and Grenada which produce higher grade qualities.(1) "The depressed state of the local industry has provided much food for thought and discussion, and the reduction in the import duties into the United Kingdom, having automatically reduced the value of the preference to these Colonies, has rendered the position more serious."(2)

On the whole the excess of production over consumption for the world is not too large. It is estimated that world stocks may safely amount to one-third of world production. At present German(3) and American demands determine prices, and as these demands are increasing, values are rising, and it may be expected that more plantations will be laid out. As more trees come into commercial bearing in producing regions, greater supplies will be available.

(1) The price of "Trinidad Middling Red" was about £70 per ton in 1913; £52 in 1923.

(2) "Report on the Economic and Financial Conditions in the British West Indies" (1924) (Dept.of Overseas Trade) p.12.

(3) During the War the cocoa world market passed from Hamburg to London.

Cotton Growing in the British Empire

(Fig. 18)

A glance at the accompanying graph of Imports of Raw Cotton into Great Britain serves to illustrate, more clearly than words, the practical monopoly of the United States in the supply of one of our vital necessities as an industrial nation. In the quinquennium 1909-13 the United States supplied on the average over 75 per cent of our raw cotton, and though this high percentage fell over the period 1919-23 to 66, American predominance still persists. Meanwhile, however, three great causes have not only helped to bring about reduced supplies to this country but will continue increasingly to reduce American exports. One of these causes is the growing consumption of raw cotton in the mills of New England and the Southern Appalachian States; the second is the fluctuating supplies due to variations in acreage following the see-saw of prices which was caused by increasing costs of production and especially of labour as well as decreases in the yield per acre; this diminishing return is largely determined by the third cause, the ravages of the boll-weevil.

Quite apart from the question of decreasing production in, and diminishing supplies from, the United States it is to the benefit of Great Britain to develop as many sources of supply as she can influence. It is part of the aims of Empire that the imperial territories should be opened up and made productive it /

British Cotton Trade

Table 60 45

Period	Imports of Raw Cotton (by Kinds). American	Brazilian etc.	Peruvian etc.	Egyptian	Indian etc	Total (1000 bales of 500 lbs.)	Re-exports (1000 bales of 500 lbs.)	Consumption (1000 bales of 500 lbs.)	Export (aver. annual) Yarn (lbs.)	Cloth (Yards)
	per cent of total					average annual figures millions				
9-13	78.4	2.2	3.2	12.2	4.0	4,445	559	3,870	215	6,358
4-18	75.3	1.8	4.9	13.0	5.0	4,030	349	3,724	162	5,164
9-23	70.3	2.0	8.6	14.6	4.5	3,020	247	2,805	160	3,523

Liverpool Prices of Raw Cotton
(average season's prices in pence per lb).

46
Table 61

	Sea Island	Brazil Pernam fair	American Middling	Indian No.1 Fine Oomra	Egyptian
9-13	28.12	7.25	6.81	5.83	10.33
4-18	40.49	11.71	10.80	8.32	15.95
9-23	65.00 (1)	18.6 4	16.64	12.48	31.29
4-25	-	14.67	13.76	11.04	29.82

(1) Price in 1918-19 since when no records.

Cotton Spindles

Table 62 47

	Aug. 31, 1913	July 31, 1925
World (thousands)	143,453	161,363
Great Britain (per cent)	39	35
Rest of Europe (per cent)	31	2 7
United States (")	22	23
India (")	4	5
Japan (")	2	3

American Cotton (in bales of 500 lbs.)

Table 48

iod	Total Crop (million bales)	Yield lbs. per acre	Exports		American consumption		
			Total	To Great Britain	In Northern Mills	In Southern Mills	Total
			Millions of bales)				
9-13	13.3	183.7	8.3	3.4	2.7	2.6	5.3
4-18	13.5	175.6	6.6	3.0	3.3	3.8	7.1
9-23	11.6	153.1	5.6	2.1	2.7	3.8	6.5

British Imports of Raw Cotton

Table 64 49

Raw Cotton	1909-13	1924
tal import(millions f centals of 100 lbs.)	22.7	16.3
m Empire (per cent)	3.9	10.4
which from India (Per cent)	3.3	6.5
British East Africa "	0.4	1.5
B ritish West Africa "	0.2	0.7
British West Indies "	0.1	0.1

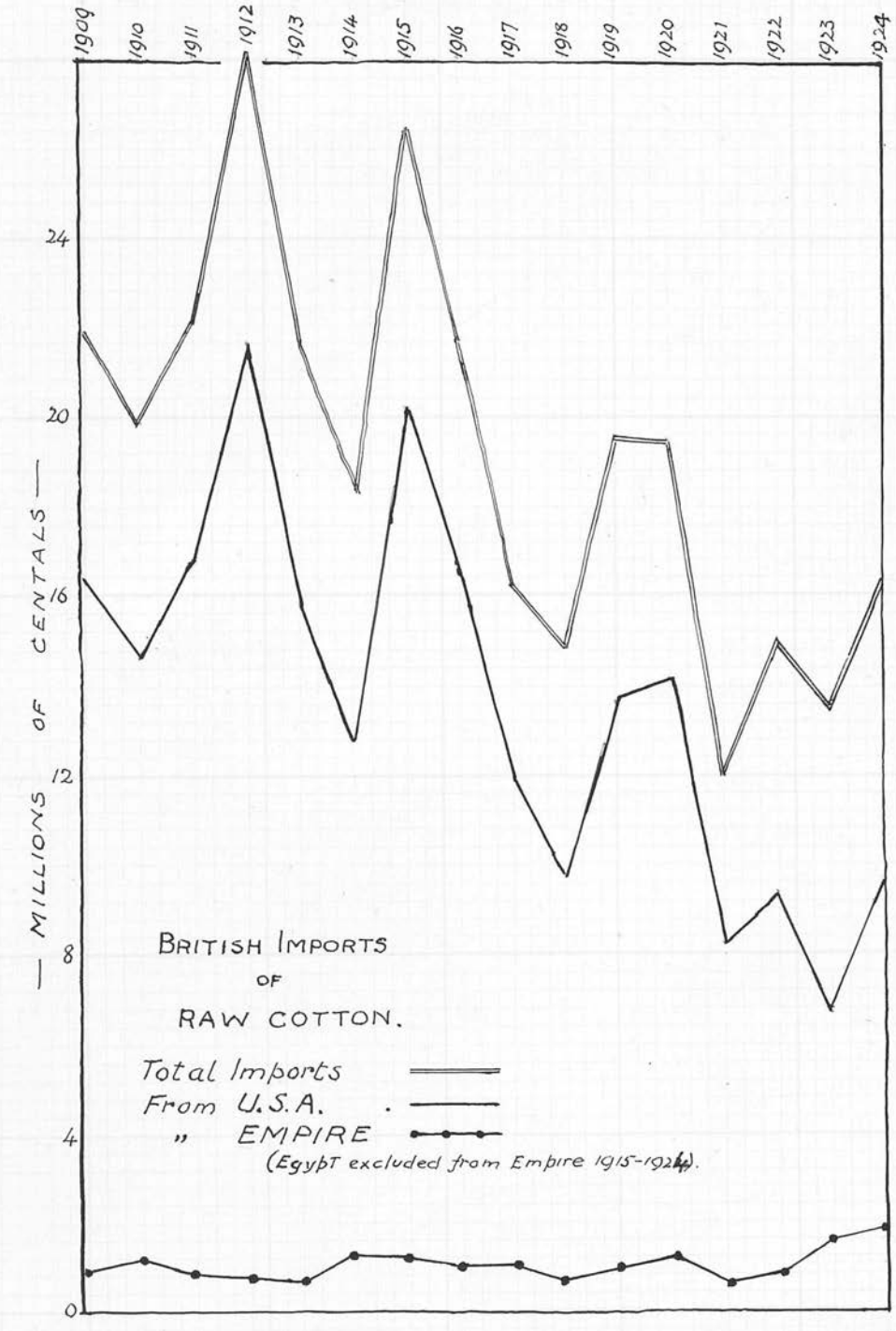

1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
24
20
16
12
8
4
0
— MILLIONS OF CENTALS —
BRITISH IMPORTS
OF
RAW COTTON.
Total Imports
From U.S.A.
" EMPIRE
(Egypt excluded from Empire 1915-1924).

Fig. 5

it is to the benefit of Britain that such crops as cotton may be grown widely in many parts of the British Empire. It would moreover, be good to feel independent of United States' supplies of raw cotton though the graph (fig. 18) gives little encouragement to such a feeling.

Other reasons have stimulated the inquiries that have been made throughout the Empire regarding the growing of cotton. The graph referred to above shows that the total British import of cotton has decreased since the War - a result partly due to the war necessity of putting more land in cotton-producing countries under food stuffs. But there was also a world shortage of cotton (calculated at 6,000,000 bales of 500 lbs. in 1922) as compared with the period 1911-14.(1) While statistics of the world's cotton crop vary with the compiler the means of various calculations show that the world's average annual crop was about 20,500,000 bales (of 500 lbs.) in the period 1909-13, as against about 18,000,000 bales in 1919-23. Consumption has been rising in the post-war period, and world production showed no large surplus till 1925-6.(2) Increasing consumption is due on the one hand to the growth of wealth among the greatest cotton-using peoples of the world, that is, in tropical and sub-tropical countries; on the other to improved methods of manufacture, the discovery of new processes of preparation of cotton wares, the use of cotton as a subtitute for /

(1) "Cotton in Australia" by R. Harding. p. 17.
(2) Large harvests in the United States (14.5) and India (4.8) raised the World's total to 25.6 million bales in 1924-5.

for other textiles especially wool and linen, and the preparation of new fabrics such as aeroplane cloth, motor tyre fabric, and various forms of hosiery. As Mr Harding states "A cotton famine has so far only been averted by the Great War, by the consequent chaos and disorganisation of trade, and by the increased prices of both the raw and the finished products.... Yet despite universal bad trade and unsettled conditions, the world's actual consumption of cotton in 1921-22 exceeded the quantity grown, the balance being provided from the 'carry over' of previous years."(1)

For Lancashire, the greatest cotton-manufacturing region of the world, the difficulty has been to find markets for her products. This is another aspect of the Empire cotton-growing campaign, since the wealth derived by the Empire's cotton growers will be partly expended on Lancashore cotton goods. "Those colonies which are becoming more and more interested in cotton growing are enriching themselves and thereby enabling the inhabitants to make greater purchases of clothing, which is of the utmost importance to Lancashire and this country as a whole".(2)

And it is precisely those qualities of raw cotton that Lancashire demands that the Empire is being encouraged to grow. Cotton is a vegetable fibre consisting of the long hairs which cover the seeds of various species of Gossypium, a genus of Malvaceae /

(1) Ibid. p.17 The carry over of American Cotton alone(1920-21) was 9,837,000 bales (E.C.G.R.Jan.1926).
(2) Cmd.2463 p.6.

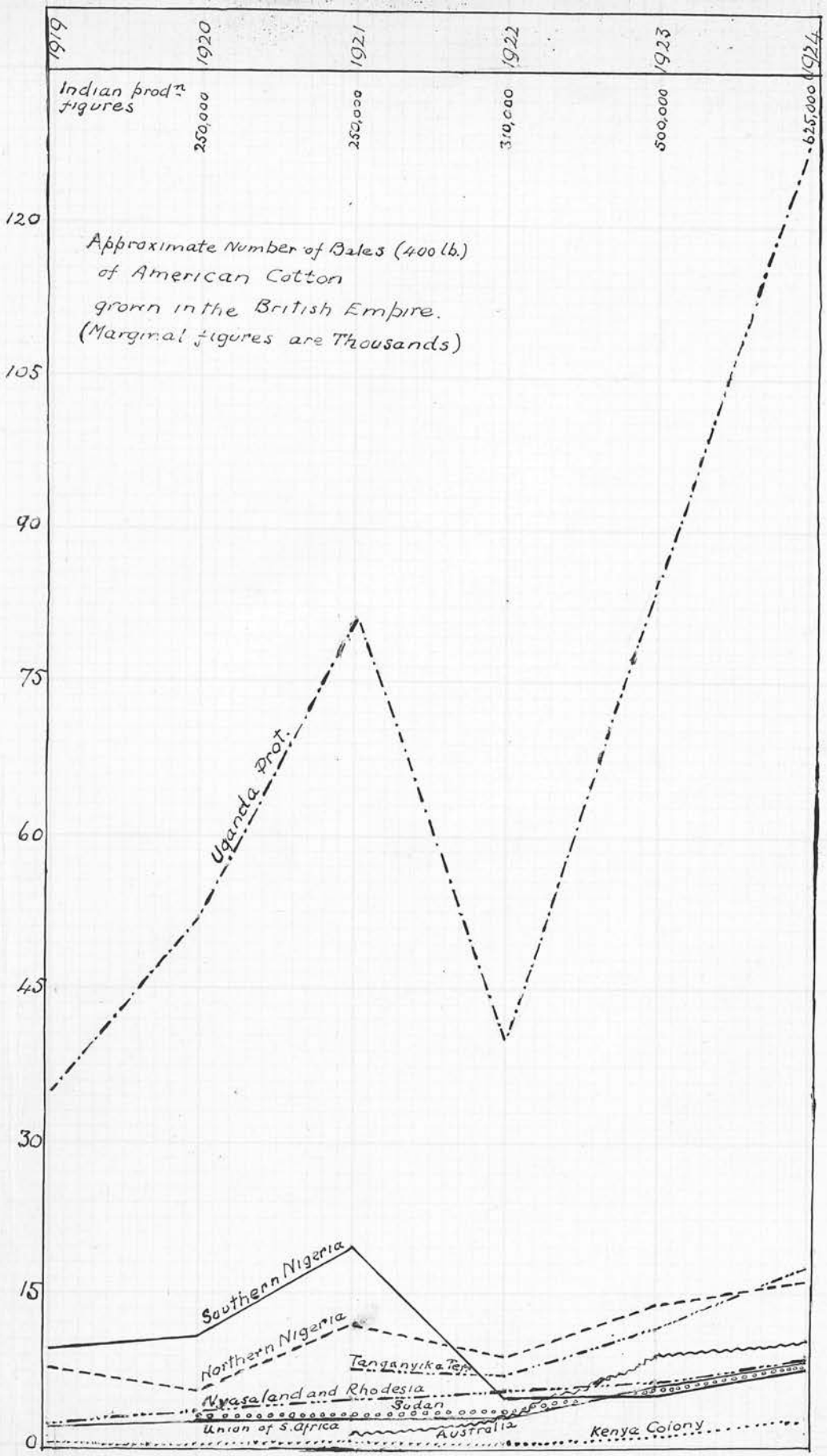

1919
1920
1921
1922
1923
1924
Indian prod.n figures
250,000
250,000
310,000
500,000
625,000
120
105
90
75
60
45
30
15
0
Approximate Number of Bales (400 lb.) of American Cotton grown in the British Empire.
(Marginal figures are Thousands)
Uganda Prot.
Southern Nigeria
Northern Nigeria
Tanganyika Ter.
Nyasaland and Rhodesia
Sudan
Union of S. Africa
Australia
Kenya Colony

Fig. 19 ~~24~~

Malvaceae, the mallow family. This genus has many varieties and these give rise to sub-varieties and even new varieties under different conditions of soil, climate, and environment; and readily undergo hybridisation. Thus while Linnaeus recognised only five varieties, other botanists enumerate as many as fifty-four.

For all practical purposes Empire cottons may be regarded as G.barbadense including long-stapled Sea Island and Egyptian varieties, G.hirsutum, including varieties of American Upland cotton, and G.herbaceum or G.arboreum, either or both of which may include Indian cottons. All varieties are derived from short-stapled cottons, and carelessness in seed selection leads frequently to a reversion to primitive types. Hence the selection of pure seed is a matter of considerable importance. The value of raw cotton depends most largely on the length of the fibres, and cotton is classed commercially as long-stapled (fibres about 1¼ to 1½ inches or more in length), medium-stapled (about ⅞ to 1 inch), and short-stapled (⅝ to ¾ inch).(1) Lancashire requires chiefly a staple of 1⅛ inches or thereabouts, and this is supplied most largely by American Upland varieties. Hence the encouragement that has been given to such varieties in British Imperial fields where production has incfeased from 56,800 bales (of 400 lbs.) in 1919 to 836,200 bales in 1924 (Fig.19).

Lancashire /

(1) "Cotton and Other Fibres" by Dr. E. Goulding p.14.

Lancashire interests undoubtedly forced the question of Empire cotton-growing into the prominence it has secured even in Government Departments, but the value of the cotton crop to the native cultivators tends to stabilise cultivation where soil, climate, and labour combine to favour the shrub. In the accompanying table (p.106) the average annual crop of pre-war and post-war periods indicates that the fostering process has been generally successful. Government interest and aid in Great Britain, backed by financial assistance from cotton spinners, gives the Empire Cottin Growing Corporation an annual income of approximately £100,000 with which to encourage cottn growing in British Dominions and Dependencies.

Previous to the foundation of the Corporation just mentioned the Lancashire manufacturers had appointed a Committee to report on the possibilities of securing supplies of raw cotton fom other sources than the United States. As an outcome of its report the British Cotton Growing Association was inaugurated in 1902. Through the efforts of the Association an official Committee was formed, and its Report (in 1917) led to the inception of the Empire Cotton Growing Corporation repesenting both the cotton trade and the Departments of State. With the legal enforcement of the levy of sixpence per bale from all spinners in 1923 an assured income was available for financing the collection and dissemination of information to cotton growers. The Corporation's work has been pressed steadily onward, its officers and servants have visited /

visited throughout the Empire, guiding producers, arranging for marketing, even buying the crops, and providing machinery for preparing the harvest for export. Its publications give the latest and fullest information regarding theadvance of Cotton growing within the British Empire.

Statistics of Imperial production show that the Imperial contribution to the world's crop increased from 14.2 per cent in the quinquennium 1909-13 to 18.4 per cent over the period 1919-23. In itself this is satisfactory but it does little to make Lancashire independent of foreign supplies. A glance at the table of Imperial production shows that while some parts of the Empire are rapidly increasing their output others are apparently restricting theirs, and the burden of supplying Great Britain falls more heavily still on those that are making progress. So far as British imports of raw cotton are concerned the Empire's share rose from 3.9 per cent. in the pre-war period to 10.4 per cent in 1924, a result partly due to the increased exports from British Africa. It must be remembered that Great Britain has no monopoly of Empire supplies For example Uganda reports that serious inquiries have been received from Japan, Spain, Russia, Germany, and other foreign lands, as well as from Lancashire; it is common knowledge that Japan is a large buyer of Indian cotton (1) and that her purchases are not confined to short-stapled varieties;

while /

(1) In 1923-24 Japan took about 46 per cent of India's total export of 3,764,000 bales; Belgium's imports of Indian cotton nearly equalled that from the U.S.A. in 1923.

while the practical interest that the United States is increasingly taking in British Empire crops, by supplying seeds for experiments in Upland varieties and by giving advice as to conditions of cultivation, shows that the world's greatest producer anticipates the possible necessity of imports in future years.

Conditions governing production - soil, climate, and labour - must be carefully studied in order to secure further development, but, as reports from various parts of the Empire indicate, cotton will be grown by natives only if it pays them better than other crops. Until they require more money, until luxuries become necessaries for them, there is lack of inducement to raise cotton. Foodstuffs must be grown, and in many parts of Africa other money crops compete with cotton, demanding less careful cultivation like ground nuts, or receiving often none at all, like the cacao tree or the oil-palm.

Though cotton may, so far as isotherms show, be grown anywhere between 40° N (1) and 35° S lat., its commercial production is quite a different matter. Gossypium is really a sub-tropical family, producing most abundantly towards the temperate margins of the belt above specified. But it is in these peripheral regions that most difficulty is found in satisfying the main climatic demand of the shrub - about 200 days in which to reach maturity between late spring frosts and those of early autumn. On the other hand where winter may be said scarcely to exist, cotton is sometimes allowed to become/

(1) Even beyond 40° N as in Turkestan.

become perennial with dire results (1) both to the district and to the cultivator. Ideal conditions for cotton growing would demand a mean monthly temperature of 65° to 80° F. during the growing period, when the soil should be kept moist, preferably by night rains or dew. Rainfall should be heavier immediately after planting, but with the opening of the flowers dry weather is essential to favour boll development. Soil, too, must be carefully considered and it is unfortunate that so little research has been undertaken in connection with this aspect of cultivation. An ideal soil is a deep sandy loam into which the tap-root can penetrate six feet down. Poor soils may be greatly improved by manuring, while a scientific rotation of crops prevents excessive loss of plant-food from the soil. Excess of humus favours vegetative growth against the production of fibre. Until local governments increase their laboratory facilities and engage soil chemists any extensive work in soils is difficult. Only now is the importance of this work being recognised, and information as to geological structure and physical qualities of empire soils being collated.

Ideal conditions of climate and soil may be said not to exist. Graphical representations of meteorological statistics such as those that follow indicate how varied are the phenomena /

(1) See p. 148.

phenomena in various parts of the Empire.(1) In each case an attempt(2) has been made to show the relation between climatic data and actual cultivation. Generally speaking the finer the quality of the fibre the longer is the phant's period of growth. Short-stapled Indian cottons are harvested 107 days after sowing, Upland varieties demand about 122 days; Egyptian 185 days; and Sea Island 200 days. Picking proceeds for two or three months longer.(3)

The quality of the cultivation depends on the stage of advancement of the cultivator, and as cotton growing and picking generally demand cheap but not necessarily skilled labour, the crop is mainly grown by coloured labourers. As a plantation worker the native of tropical lands requires constant supervision. He is about as interested in the farming as the average operative in a large cotton factory is in his work. In many parts of the Empire labourers for European plantations are difficult to obtain because of sparseness of population; in other parts where population is more dense the inhabitants are economically independent of work for wages. Where population is sparse labour is necessarily engaged in food production /

(1)Research into the relation of the cotton plant to climatic conditions is being undertaken, but in many cotton-growing areas statistical records are inadequate for the purpose. Cotton may be grown in the hot season as in Mesopotamia, in the cool season as in the Sudan and Southern India, or its cultivation may be determined almost solely by conditions of rainfall as in Nigeria. In all parts the rainfall is small when the bolls begin to ripen. (See a preliminary report-"The Cotton Plant in relation to Temperature and Rainfall," by C.B.Williams,M.A. F.E.S. Cairo.1923)(2) based on the method of the E.C.G.C.and on Harding."Cotton in Australia". (3) Harding op.cit.p.8.

production; where population is dense, nature produces abundantly and the native is indolent and careless. Even where plantation labour is obtainable it is often irregular; for the native a contract is binding only for so long as he wishes. Hence the planter must study his workers and maintain them in such physical comfort as will induce them not merely to work efficiently and steadily but also willingly and regularly. On native farms cultivation is generally backward, the result of ignorance and tradition. Improvement is secured by actual demonstration on government farms, by legal enactment as to e.g. seed to be used or time of cutting down the annual shrub, or by the cash prices given for better qualities of fibre. Taxes must be paid, and if there is no further inducement to the native to have money he will produce only sufficient to pay his tax. Traders, however, supply commodities that appeal to native tastes, and to procure these the native must have money. The result is that as export from a tropical part of the Empire increases, the imports of, say, cotton piece goods are increased. Hence the stimulation of native production tends to steady employment in Britain. But it also requires greater government activity in the parts of the Empire concerned. No one can fail to be impressed by the constant reiteration of the cry for transport within the Empire. Railway and feeder transport are insisted on as a stimulus to development. Production is greatest where facilities for transport /

transport are at hand, as is shown by the maps of production accompanying this section;(1) and the extension of railway lines is always followed by growth of trade.(2) The securing of greater labour supply is in the main a question of social and medical propaganda.(3) Better quality of products and more economic use of land depend on the educational work of agricultural officers. All such advances are possible because of the receptivity of the native's mind and his ability and readiness to imitate the white man. In practically all cotton-growing parts of the Empire future developments depend upon native efforts on their own holdings: the work of the white man is to advise on the one hand, and to purchase, transport and market on the other. As educational advancement raises the status of the native he will share increasingly in all these commercial operations, just as his political progress is reflected in his native councils.

Although it is categorically stated, and accepted as a matter of course, that white men cannot work in the tropics, the development of tropical Australia has been almost entirely brought about by European cultivators. Cotton growing in Queensland, as yet only in its infancy, has been successfully carried on by white labour, and it is confidently asserted that, even with the higher costs of production necessitated by white labour, raw cotton can be profitably marketed so long as the price of middling American at Liverpool does not fall below 12d./

(1) See especially map of Nigeria. p. 138.
(2) See graph of Gold Coast (fig. 5). p. 83
(3) See pp. 294-5

12d. per lb. Intelligent and presumably progressive white labour should soon secure a very high level of farming resulting in increased quantities of excellent fibre. Commercial men can organise the trade in Australia to benefit by the economies of co-operation, and force improvements in local and ocean transport services. Thus will cotton-growing Australia rise above her difficulties at home, overcome the disadvantage of her geographical position at the end of the longest trade route to Lancashire's market, and so compete in friendly rivalry with Nigerian supplies grown by native labour and nearest of all to Cottonopolis.

The cotton plant, like every other kind of vegetable growth, suffers from the attention of insects and the attacks of various forms of disease. Over five hundred species of insects, mites, etc., have been enumerated as feeding on the cotton shrub from root to boll, at one stage or other of its growth and development.

In the United States the boll-weevil is by far the most serious pest, destroying a considerable proportion of the crop, and progressively extending its ravages throughout the cotton belt. Fortunately it has not yet appeared in the cotton fields of the British Empire.

Yet the Empire crops suffer from the attention of a large number of pests. The pink boll worm (Platyedra gossypiella) appears to have spread westwards from south-eastern Asia. Reaching India in 1843 it migrated to Africa and was recognised in /

in German East Africa in 1904, while it appeared in Egypt (perhaps via Palestine) in 1906 or 1907. By 1920 it had found its way to the West Indies and it has been reported from all except South African fields. Its life-history is known, and as larvae rest within the cotton seeds during the winter, they may be destroyed by a simple process of heating the seeds. In the West Indies the pink boll-worm is estimated to have caused the loss of between 5 and 25 per cent of the crop in 1921.

Other destructive moths belong to the genus Earias of which E.insulana, the spiny boll-worm, is wide-spread, and E.fabia is common in India. They are readily destroyed by a parasite (Rhogas Lefroyi) bred in Indian agricultural stations for the purpose.

The red boll-worm (Diparopsis castanea) is a serious pest throughout Africa except in Egypt. It is particularly destructive in South Africa and Nyasaland. The American boll-worm (Chloridea obsoleta), universally distributed, destroys both cotton and maize. It is specially troublesome in Southern India and Australia. Cotton-staining bugs are widely distributed.

Many insects attack the leaves of the cotton plant. Of these the cotton worm (Alabama argillacea) is present in the /

the West Indies. In the United States its ravages have been most severe in its twenty-one year cycle dating from 1783. The boll-weevil breeds on fallen bolls which are protected from the sun by fallen leaves. Such leaves are destroyed by this worm. Its next maximum should occur in 1932, and its activities may perhaps permit the sun's heat to reach the fallen bolls and thus reduce considerably the number of weevils. The cotton thrips and aphis also attack the leaves of the shrub, the former being destructive especially in the Sudan, West Indies, and India, the latter in the West Indies.

By scientific researches into the life histories of these insect pests much may be done to mitigate their ravages; by the prompt and regular burning of cotton plants immediately after picking the numbers of insects may be considerably reduced; and by the evolution of varied resistant types of shrubs the impairing of the fibre may be considerably lessened. (1)

What of the future prospects of Empire-grown cotton? Post-war supplies (excluding Indian) in 1924-25 are between five and six times those of the pre-war quinquennium (Table 51). What is more heartening is the fact that the annual Empire crop shows a steady growth during the years since the war. The crop of 1924-25 is more than twice as large as that of 1922-23, while the estimate for 1925-26 indicates an increase of over 20 per cent on that of the year before. Such results/

(1) Summarised from "Insect Pests of Cotton" by Lefroy and Lean. (E.C.G.R.July 1924).

results are due to native efforts in Uganda which produced more than half of the total for 1924-25, in the Sudan, and in Nigeria. Altogether the total crop for Empire fields (again excluding India) in 1924-25 was not much over one-third of a million bales of 400 lbs., - can that yield be increased to two or three millions of bales of high grade American Upland qualities suitable for Lancashire?

Any reply to this question is speculative, for estimates may be completely falsified by any of the fluctuating factors that affect production, particularly the price at Liverpool. Such estimates are however attempted, and that of Mr Harding (1) may be as reliable as any. He gives as an optimistic forecast of production of Empire-cotton about 1930 the following to which the (rounded) figures for 1924-25 are added - Table 50

Thousand Bales of 500 lbs.	1924-25	1930
Uganda	157	1,000
Nigeria-	31	1,000
Sudan	36	500
Queensland	12	300 (2)
Tanganyika Terr.	15	—
Rest of Africa	26	200
Iraq	2	40
West Indies	3	10
	282	3,050

Can /

(1) Op.cit.p.27. (2) Ibid.p.57 (a figure for Australia is not given in Mr Harding's table).

Can the 1924-25 crops be increased ten-fold in five years?

As some contribution in part answer to this question a brief summary of production in the various parts of the Empire is appended. In each case some attempt is made to outline historical development, to indicate factors limiting yield and extension of the crop, and to conjecture whether expansion is possible. To avoid unnecessary repetition certain aspects of the problem of future developments are emphasised in selected parts of the Empire where, perhaps, they are more in evidence, or where the information has been more fully collected. Such aspects refer mainly to communications, to competing crops, or to labour difficulties. Other aspects that must radically affect production are the price of the raw material at Liverpool and the establishment of cotton factories within the Empire. There is no doubt that a rise of price in Great Britain stimulates production over the world, and this is particularly true of Empire crops. Generally it is admitted that so long as Liverpool prices are 12d. or more per lb. Empire contributions will continue to rise; but the fact must be faced that should the price drop below that figure, cultivation may be seriously curtailed. In this case supplies will be short and economic laws come into play forcing prices up and thereby renewing the stimulus to cultivate. Slight notice has been taken of local industries as tending to check exports, but this possibility must not be overlooked. Many native peoples,

- not /

not only in India and Nigeria, - utilise their cotton crops for manufacture, and Australia is undertaking consumption of her crop. On the whole, however, immediate and rapid increase of cotton manufacture is scarcely to be anticipated within the Empire; when it does establish itself the local production of fibre will tend to increase, and any surplus w ill be exported overseas.

IMPERIAL PRODUCTION OF COTTON

Table 65. 51

	1909-13	1924-25
	Average Annual Production in Thousand Bales of 400 lbs.	
World's Crop	28,870.0	31,978.0
India	4,039.0	6,008.0
Total Empire(excl.India)	62.0	357.0
Africa (Total)	50.0	331.0
Uganda Prot.	18.0	196.0
Anglo-Egyptian Sudan	15.0	45.0
Nigeria	11.0	39.0
Tanganyika Territory	-	19.0
West Indies	6.0	4.0
Nyasaland	5.0	8.0
Union of South Africa	0.1	17.0
Australia(Queensland only)	0.1	15.0
Cyprus	5.0	3.0
Kenya Colony	1.0	2.0
Malta	0.6	0.6
Iraq	-	2.4
Northern Rhodesia	0.2	0.4
Southern Rhodesia	0.0	5.0
Empire's Share of World's Crop	14 per cent	20 per cent.

~~68~~

107

~~19.~~

COTTON PRODUCTION IN THE INDIAN STATES Table 66

	Average Annual Production	
	1911-13 BALES OF 400 LBS.	1919-23 (thousands)
Bombay and Sind	1,248	1,230
Central Provinces and Berar	928	998
Punjab	409	518
United Provinces	388	283
Madras	371	404
Hyderabad	333	831
Central India & Gwalior	236	217
Baroda	156	106
Rajputana	110	79
Burma	44	52
Bengal	23	20
Bihar and Orissa	17	16
Ajmere Merwara	18	16
Mysore	16	17
N.W.Frontier	13	5
Assam	11	14

COTTON
MAP OF
INDIA.
No. 1.

PREPARED IN THE DEPARTMENT OF STATISTICS, INDIA,
TO SHOW DISTRICT BY DISTRICT
THE COTTON AREA IN INDIA.

Scale 1 Inch = 160 Miles.

Miles 160 120 80 40 0 160 320 480 Miles

REFERENCES.

PUNJAB
1 KAPURTHALA
2 NABHA
3 MALER KOTLA
4 LOHARU
5 DUJANA
6 PATAUDI

KASHMIR
1 BHADARWAH

BALUCHISTAN
1 BOLAN
2 MARI BUGTI COUNTRY
3 SIBI ADMINISTERED AREA

RAJPUTANA
1 KISHANGARH
2 PARTABGARH
3 TONK

UNITED PROVINCES
1 BENARES RAJ

BOMBAY
1 MEHWAS
2 SURGANA
3 JAWHAR
4 JANJIRA
5 SHOR
6 SATARA AGENCY
7 BIJAPUR AGENCY
8 AKALKOT
9 SAVANTVADI
10 SOUTHERN MARATHA JAGIRS
11 BARODA
12 PANCH MAHALS
13 DAMAN

CENTRAL PROVINCES
1 MAKRAI
2 KAWARDHA
3 SAKTI
4 SARANGARH
5 KHAIRAGARH
6 MANDGAON
7 CHHUIKHADAN

CENTRAL INDIA
1 SITAMAU
2 INDORE
3 KHILCHIPUR
4 NARSINGHGARH
5 RAJGARH
6 ALI-RAJPUR
7 SAMTHAR
8 KOTHI
9 SOHAWAL
10 JASO
11 CHARKHARI

MADRAS
1 SANDUR STATE
2 BANGANAPALLE STATE
3 PADUKKOTTAI STATE

BENGAL
1 MURSHIDABAD
2 HOWRAH

BURMA
1 HANTHAWADDY

HYDERABAD
1 AHMADNAGAR
2 SHOLAPUR
3 KISTNA

REFERENCES TO SHADING

DISTRICTS GROWING COTTON.		
5,000 TO 100,000 ACRES.	100,000 TO 500,000 ACRES.	ABOVE 500,000 ACRES.

SOWING of COTTON BEGINS ——
PICKING do. do. – – – –

18. 9251.20102.1845.5000.1.20.

Malby & Sons, Lith. HELIOZINCOGRAPHER AT THE SURVEY OF INDIA OFFICES, CALCUTTA.

Note. — No stippling has been made for any District containing less than 5,000 acres under cotton.

INDIA

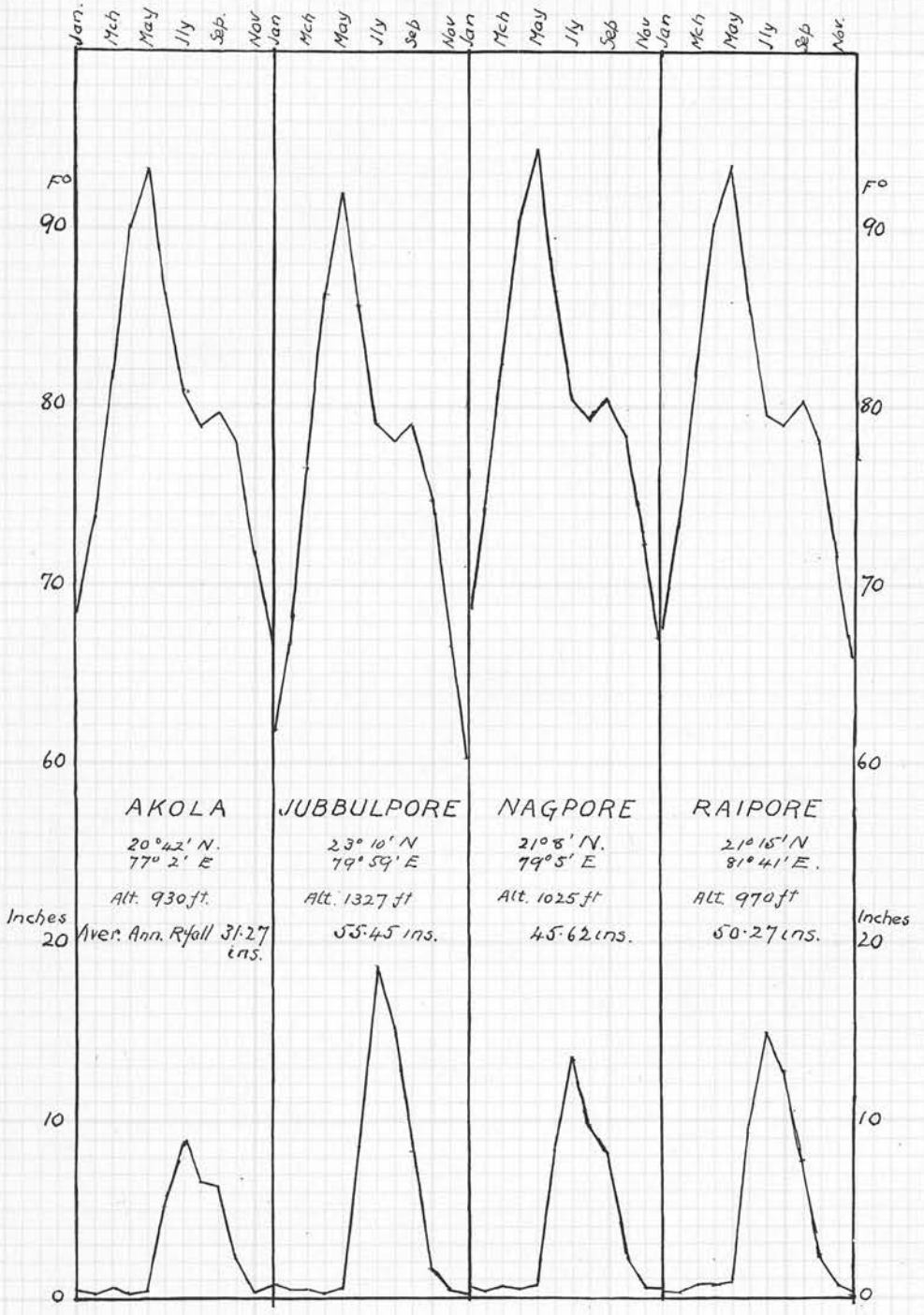
Only in the United States is the annual cotton crop larger than in India which produces almost one quarter of the world's supplies of this fibre. No comprehensive examination of Indian cotton growing is possible in this account which seeks only to note the progress of the crop within the British Empire. Hence not so much falls to be written on cotton production in India where the post-war figures of production do not differ greatly from those of immediately pre-war years. By far the most important cotton-growing states are Bombay with Sind, Central Provinces and Berar, and Hyderabad, which yield over 63 per cent of the total crop.

Unfortunately for Lancashire Indian cotton still consists for the most part of a short-staple variety, so that only a small percentage (1) of the export reaches the British market. From the Indian point of view, however, this short-staple cotton is the product of an early-maturing plant, excellently adapted to soils where the rainy season is short. Long-staple cotton is grown under irrigation in the Punjab, the North-West Frontier Province, the United Provinces, and Sind.

Future extensions of cotton growing would appear to be wrapped up with the development of irrigation schemes, and as the long-staple areas mentioned above are those in which

cotton/

(1) 8 per cent in 1923. The Indian Cotton Committee reported that 15 per cent was of Lancashire staple in a normal year.



CLIMATIC CONDITIONS of the NORTHERN DECCAN.
(Figures from Indian Year Book, 1925).

Fig. ~~26~~ 21

cotton is grown under irrigation, it would appear that any increase of crop following irrigation expansions will consist of long-stapled cottons. Any considerable expansion of cotton lands is thus limited to those areas in which irrigation schemes are in progress, that is, mainly to the Punjab and Sind. In the Punjab the Lower Chenab Canal irrigates nearly 2,000,000 acres of what was formerly waste land while another 400,000 acres have been reclaimed by means of the Lower Jhelum Canal. To these areas the Lower Bari Doab Canal will ultimately add close upon 1,600,000 acres. On Canal irrigated areas American Upland cotton is grown; elsewhere short-stapled "Bengals is raised.

In 1922-3 the ~~percentage~~ percentage under irrigation of the total cropped area in the Punjab was 33.7; in Sind 80.7; in the North-West Frontier Province 15.5; and in the United Provinces only 7.5. The total area irrigated in India for the same year was over 28.3 million ~~areas~~ acres of which 38 per cent were in the Punjab, about 13 per cent in Sind, and over 9 per cent in the United Provinces.(1) The Indian Government is carrying through two great projects the completion of which will add over eight million acres to the irrigated area at present under cultivation. In the Punjab the Sutlej Valley Project consists of three weirs on the river Sutlej below the confluence of the Beas and one on the Chenab below its junction with the Sutlej(2); from these twelve canals will carry water over five million/

(1) N.W.Frontier Province less than 1.5% Madras nearly 2%
(2) This part of the Chenab is called the Panjnad.

lion acres. Nearly two-fifths of this area will be under ennial irrigation. Politically about two million acres will be British territory, close upon three million in Bahawalpur, and ,000 acres in Bikaner. Over the three areas almost 4,000,000 es of waste and valueless land will become available for sale l colonisation. This area which will thus be reclaimed lies th of the great irrigated lands. In Sind the Lloyd (4) barrage oss the river Indus at Sukkur will be the greatest work of the d in the world. Ten canals will convey the ponded water over e 6,500,000 acres of culturable land of which one-third is d under inundation irrigation to be given an assured supply of ter. In the tract affected by the barrage 750,000 acres may developed under cotton, and it is anticipated that an annual ld of 600,000 bales may ultimately be secured. A high grade ng-staple cotton for this area is much desired and it is proposed undertake research work at two stations equipped with perennial rigation by pumping, where a botanist will endeavour to pro- e a variety to meet local requirements - hardy, early turing, prolific, able to withstand the hot winds of April May as well as to tolerate the "kalar" salts in the soil, prove resistant to red leaf blight, - a sufficiently severe t for any scientist.

In the Punjab, on account of cold winters, the cotton wing/

(4) So named after Sir George Lloyd, Governor of Bombay, who laid the foundation stone in October 1923.

growing season is much shorter than in the provinces to the south, and the best yields are obtained in the south-eastern districts (where the cotton may be grown without irrigation) and in the western canal colonies. The shrub may be cultivated on all but very light soils; it is frequently sown on land which has been manured for a previous crop. "Desi"(indigenous) cottons and acclimatised American, known as Punjab American, are grown in roughly equal areas in the province, but American cotton appears to be suffering a diminution in both yield per acre and quality of fibre.

In the United Provinces the Sarda Canal will irrigate some two million acres.

While in Northern India cotton is a summer crop because of the winter cold, in southern Madras it is grown in the winter season to suit the rainfall, and because the cold factor need not be considered. Even in Madras Presidency there are variations in cultivation periods, for sowing takes place in July and August in northern fields, in October in the southern. All over the Presidency picking begins in February. Thus there is a short growing period reflected in the short fibres secured. "Nothing but the retentive nature of the black cotton soil, the drought resistant character of the Indian species, and the intelligent labour of the ryot could enable the crop to survive!" (1)

Conditions of cotton growing, grading and marketing are improving over India where the work of the Indian Central Cotton

(1) "Cotton Growing in Madras" by Dr Barber(E.C.G.R.April 1925).

ntral Cotton Committee is meeting with considerable success. arious problems have been examined by this Committee and it has cured observance of many of its resolutions. Even apart om such governmental influences Indians are paying more reful attention to cultivation. On the black cotton soils the Central Provinces iron ploughs have become popular d agriculture generally has benefited.

Of the future of the short-staple cotton it is difficult o speak. It must be remembered that Indian mills consume ther more than half of the commercial crop, and that there are rkets in Japan and elsewhere for the exportable short-stapled ttons and that the greatest shortage is of cotton of 1⅛ inches and pwards. Such cotton can be grown on large tracts of Indian fields d local mills would absorb considerable quantities, while the xports are assured.

It has been estimated that by 1930 India should produce ix million bales of raw cotton of which one third should ave a staple of 1 to 1⅛ inches. If such an estimate could e realised Lancashire's burden and dependence on American pplies would be happily lightened, and India's prosperity il ingly increased.

C E Y L O N

Despite the anxiety of the Government to encourage cotton-rowing in Ceylon, it is doubtful if the production will ever very large. In 1922-23 the yield was 49 bales (of 400 lbs.);

this was increased to 324 in the year following, but in 1924-25 fell to 121 bales. In any case the whole of the fibre is consumed locally in Colombo. Cotton is grown in the Manaar district and in a strip along the east and south-east coast where, outside of the few small towns, population is practically absent. Railway extension to Trincomali and Batticaloa may open new areas, but it is doubtful if climatic conditions are favourable, and the country is malarious. At Batticaloa experiments with Cambodia cotton in 1923 were partly spoiled by he avy rain during the sowing period, partly by boll-worm and leaf-roller pests. In 1923-24 the crop was successful in the Hambantota District, Metale North, and the Uva Province. American Upland seeds from South Africa have been tried for "chena" (1) cultivation round the Ambalantota Cotton Experiment station.

U G A N D A

Of all the tropical parts of the British Empire Uganda offers the greatest promise as a producer of raw cotton for the mills of Lancashire. In no imperial territory has progress been so rapid and continuous; in no part has cultivation been so successful. The prosperity of this Protectorate is bound up with cotton of which the export increased more than three-fold between 1914 and 1924; in the latter year ginned cotton represented almost 90 per cent by value of the total exports of/

(1) portion of forest or scrub temporarily cleared for crops - a widespread system in the east.

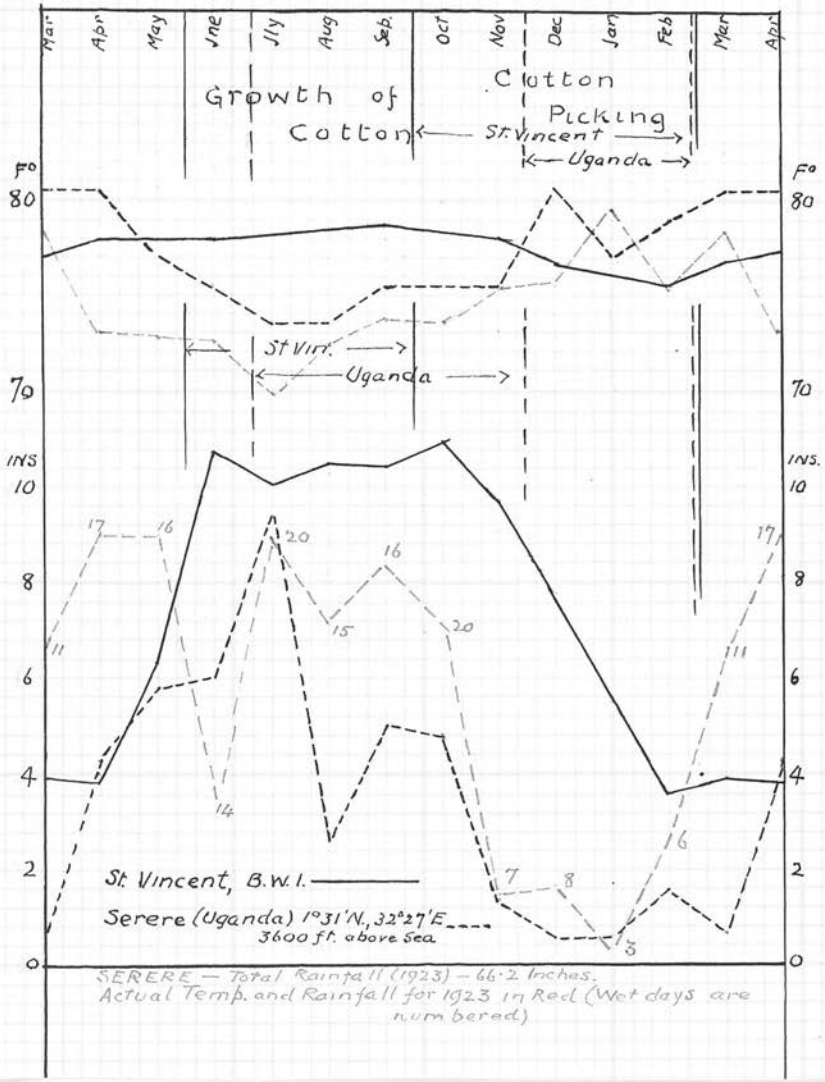
of the country.

Of the total area under cotton in 1924 over 61 per cent was in the Eastern Province where 355,111 acres were cultivated. In this province (1924-25) 90 ginneries and 2 presshouses are in service but are inadequate to deal with the rapidly growing crop. In Buganda also (33 per cent of cotton area) development is taking place as is shewn by the 52 ginneries and press house in that kingdom. In the Northern Province 5 ginneries serve the needs of cotton growers, but in all provinces the number of ginneries is increasing and two are erected in the Western Province. Hand ginneries are now nowhere used.

Uganda cotton, grown by peasant cultivators on small patches, is at present entirely a rain crop sown between May and July and picked from December onwards. After ginning and baling it is sent to the coast from January to June. Thus the crop is available when American supplies are short. Moreover as the country is, for the most part, at present free from the usual cotton-plant pests, cultivation and grading are simplified. The staple of about 1¼ inch is highly priced in Lancashire markets.

Tractor ploughs, presented by the Empire Cotton Growing Corporation, have been utilised to open up more cotton land at the base of Mount Elgon. In 1922 Bagishu cultivators from the Bagishu Hills were accommodated on half-acre allotments

in /


Mar.
Apr.
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Nov
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Growth of Cotton
Cotton Picking
St. Vincent
Uganda
Fo
80
70
INS.
10
8
6
4
2
0
St Vin.
Uganda
St. Vincent, B.W.I.
Serere (Uganda) 1°31'N., 32°27'E
3600 ft. above Sea
SERERE — Total Rainfall (1923) — 66·2 Inches.
Actual Temp. and Rainfall for 1923 in Red (Wet days are numbered)

Fig. 22

in the Siroke valley, and by 1924 the number of producers on the 780 ploughed acres was about 1500. From the ploughing schools established by the Department of Agriculture, trained natives have carried the art and, in addition to large native purchases of ploughs, ox-drawn ploughs have been loaned on small-holdings as well as in communal ploughing schemes.

Uganda's most pressing problem is the export of her crop. At present it is collected at Jinja and Port Bell for lake transport to Kisumu and thence by rail to Kilindini. Rapidly growing production demands alternative facilities and the projected railway extensions shown on the accompanying map are being speedily pushed forward. Throughout Uganda motor traffic adequately handles the feeder transport and road repairing as well as the making of new transport avenues proceeds apace. From Kampala a road-rail track to Bombo was opened in 1923; its success would lead to further developments.

By these means raw cotton reaches railway, river or lake. The only railways in Uganda run between Kampala and Port Bell (7 miles) and between Jinja and Namasagali (62 miles). The Busoga Railway Marine of two stern-wheel vessels of 100 and 50 tons cargo capacity respectively, plies along the navigable stretch of the Victoria Nile from Namasagali, including the shores of lakes Kioga and Kwania, to Masindi and Atura.

Floating sudd hampers navigation considerably but channels are cut to afford access in such areas. Beyond Atura the Karuma Rapids and Murchison Falls interrupt navigation

to /

to Lake Albert on which a Government service of two small steamers, with headquarters at Butiaba, allows of communication between the Belgian ports of Kasenyi and Mahagi on the Nile. Below Nimule rapids again prevent navigation as far as Rejaf.

Further increases to cotton production are limited only by the provision of greater transport facilities and the supply of labour, along with native willingness to cultivate more land. As yet only a fraction of the land suitable for cotton is under that crop. Labour shortage is marked between the picking and sowing of cotton, i.e., during the transport period, because after payment for his crop, the native is unwilling to labour. Ginneries frequently are unable to work full time and the advantage already referred to (in marketing the crop when American supplies are short) is lost. Even at the Government Agricultural station at Serere labour is lacking to pick the selected cotton seeds for issue to natives. (1)

THE ANGLO-EGYPTIAN SUDAN

Production of cotton in the Sudan increased three-fold between 1918-19 and 1923-24, but the cultivation is as yet only in /

(1) Cmd. 2387 p.141. Annual Report of the Dept. of Agric. 1923, pp.5 & 7.

is in its infancy. Cotton is grown under three main types of conditions which are shown in the following table for pre- and post-war periods.

Table 67 53

	1913	1923
	Thousand Acres	
Under artificial irrigation	9	25
" rain	4	6
" natural flood	25	30
	38	61 (1)

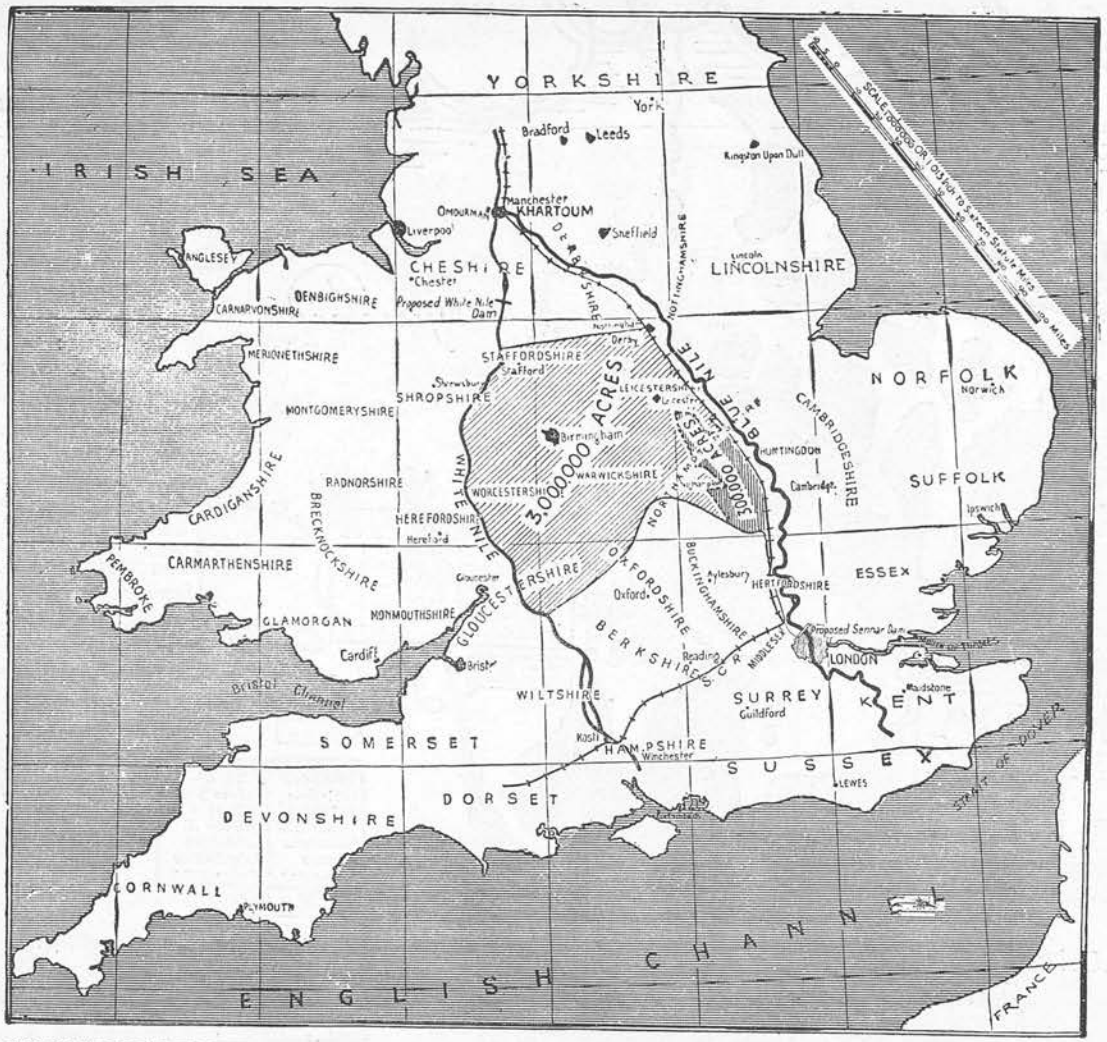
"The Sudan consists of three natural Zones, the desert zone in the north, where cultivation is only possible in a narrow strip on either bank of the Nile; a central zone where there are large areas of fertility, including the rainlands of Kassala and Tokar, the Gezira plain, the pastures and gum-forests of Kordofan; and a southern belt, where the soil is richest and the rain tropical." (2) In each of these zones the cultivation of cotton is carried on to some extent.

In the first or desert belt it is grown along the Nile northwards from Khartum to Halfa. Fields at Zeidab and in Berber and Dongola provinces are irrigated by pumps and grow American cotton.

The central zone rainlands have an annual precipitation that is not everywhere sufficient for cotton which requires twenty inches. In the Blue Nile Province the average rainfall at Wad Medani is only fourteen inches. There cotton is grown "in natural depressions known as "uguds", into which water naturally/

(1) about 3% of total cultivated area of Sudan.
(2) Ency. Brit. Vol. 32. p.613.

THE GEZIRA IRRIGATION SCHEME



GEOGRAPHICAL LECTURES 2,692—Revised and Reprinted, December, 1921, G. STAMFORD.

Sup. 26 23

naturally drains, or in small quantities near banks constructed in places where there is some slight slope, so as to concentrate the water falling on the whole of a plot of land on to one particular portion of it." Under such conditions production is necessarily limited and can be increased only by irrigation.

In the Gezira plain between the Blue and the White Nile a vast scheme of irrigation is in progress. A huge barrage over two miles long, has been erected at Makwar on the Blue Nile, 170 miles above Khartum.(1) Some 110,000 million gallons of water stored above the dam will be drained through the clayey loam soils by the Gezira Canal (35 miles long) which will distribute through about 600 miles of smaller canals over, at first, 300,000 acres of which, in order to preserve a three-course rotation, one-third will be cropped in cotton each year. At present 20,000 acres of this region are irrigated from the Blue Nile by four pumping stations. Egyptian Sakellaridis(2) has been found the most suitable variety to /

(1) Owing to fears of consequent reduction of flood water in Egypt the White Nile will be dammed at Gebel Aulia about 24 miles south of Khartum for the benefit of that country.

(2) Sakellaridis(Sakel), an extra strong Egyptian cotton of about 1¼ inch staple, named from its discoverer, dates from about 1907. It grows almost anywhere in Egypt; yields heavily with a high ginning out-turn; and is second only to the finest Sea Islands in quality and spinning capacity. ("The World's Cotton Crops," by John A. Todd).

to cultivate. "The completion of the Gezira irrigation scheme will open a new era in the economic history of the Sudan. Conditions in the Gezira will be entirely altered when the country ceases to be dependent on the small and unreliable rainfall, and the production in large quantities of a valuable crop such as cotton will bring a degree of prosperity hitherto absolutely unknown."(1) The casual labour will, it is hoped, be provided by Mahommedan pilgrims whose route to Mecca passes to the south of the irrigated lands; of actual cultivators there are plenty in the Gezira.

In Kassala province there is a much greater rainfall but a shortage of population. Cotton is grown in the delta of the river Gash(2) which flows from Abyssinia, with a variable volume, to its delta just north of Kassala. The river floods early in July, and flooding lasts for about seventy-five days. After the water has soaked into the land the Sakellaridis seed is sown and there is no rain after October. The seed cotton is exported by rail <u>via</u> Thamiam to Port Sudan where it is ginned. The extension of this new railway westwards to Makwar would open a rain-grown American cotton belt between Gedaref and the Blue Nile.

At Tokar, the centre of the Baraka delta near the Red Sea shore, there is another valuable Egyptian cotton area. Like/

(1) "Cotton Growing within the British Empire" by L.G.Killby E.C.G.R.Oct.1924 p.262.

(2) 60 miles long by 10 to 20 miles wide.

Like the Gash the Baraka comes from Abyssinia and the uncertainty of its volume and course renders the irrigated area variable. Control of both rivers is necessary, but it is doubtful whether their produce would repay the cost of regulation. The flooded area round Tokar is between one-fourth and one-fifth of that round Kassala. A light railway from Tokar conveys the cotton to Trinkitat on the Red Sea, only twenty miles distant.

Cotton growing is developing in Kordofan whence the El Obeid line gives an outlet to the Nile at Kosti. Above this part there is a rain-watered area of some 250,000 square miles that offers great possibilities, especially in the Upper Nile and Nuba Mountains provinces. In this huge tract, more than in the irrigated Gezira, lies the future of Sudan cotton-growing. Rainfall is sufficient and reliable for American cotton and the river offers easy outlets at Tonga and Kaka, while farther north the El Obeid line of railway is within reach. One difficulty lies in persuading the native farmers that cotton will pay. For this purpose demonstration farms have been opened at Eliri and Kadero in the south and north respectively of the Nuba country, while the Shilluk tribe of the Upper Nile province are realising the value of cotton growing as a means of buying cattle or wives instead of securing them by raiding.

Questions of soil conservation, economic rotation of crops, improved method of cultivation, and the control of pests /

pests (of which thrips and aphis are most prevalent) have been laid before specialists appointed by the Sudan government in conjunction with the Empire Cotton Growing Corporation and the Sudan Plantations Syndicate. If the export of Baladi (local) cotton is prohibited, the quality of Egyptian and American outputs is assured since there will be no admixture of the inferior local variety.(1)

KENYA COLONY

From its position between two important cotton-growing lands one might expect that Kenya would yield a large cotton harvest. This is far from being the case. Areas which are sufficiently fertile for cotton are situated at elevations which forbid its cultivation. Seed was obtained from the Seed Selection Farms at Kampala (Uganda) in the early years of the War and sown in the Nyanza province. The necessary low altitude combined with suitable soil, humidity and warmth is found only round the shores of Kavirondo Gulf and the neighbouring lake shores of North and South Kavirondo, in parts of the Embu district, and along the east coast. In 1923 about 10,000 acres were planted with cotton seed in the Kavirondo district on the eastern shore of Lake Victoria, and it was expected that this area would be quadrupled in 1924.

A/
(1) See "The Cultivated Crops of the Sudan including Cotton" by W.A.Davie (Sudan Government)

branch of the Uganda railway would aid export of the crop, but water transport to Kisumu might be preferred. The lack of scientific supervisors and trained native assistants will tend to retard development.

Along the banks of the Tana river Egyptian cotton could be extensively raised under irrigation, but the cost of irrigation works has prevented development for the present.

Systematic efforts to develop cotton growing were first made in 1922 when Agricultural Supervisors were detailed and a ginnery established. As one ginnery could not deal with the crop of 1922, much of the seed cotton was sold in Uganda. Some half-dozen ginneries have been erected. At the end of 1923 a Cotton Ordinance was enacted to give the Governor-in-Council powers to control the industry in all its phases.

TANGANYIKA TERRITORY

In Tanganyika Territory sufficient exploration of resources has not yet been undertaken for anything like an adequate account of cotton-growing possibilities to be formulated. That the prospects for the crop are bright is indicated by the fact that under German administration 2192 tons of lint were exported in 1913. During succeeding years the exigencies of War conditions led to an almost complete cessation of cultivation, and even under the fostering care of British officials since 1919 these pre-war figures were not exceeded until 1924 when the export reached 2,541 tons.

According to the former German Agricultural Expert in Mpanganya Agricultural Station, Rufiji province, the regions best suited for cotton cultivation in the Territory are those with a single period of rainfall in the year. The area which generally fulfils this condition is the southern part, and from this part the bulk of the exported fibre is derived. In the northern part, where there are two rainy seasons in the year, only Mwanza and Bagamoyo produce large crops. The ~~accompanying~~ map (p.269) shows approximately by green tinting where most cultivation has taken place, and it will be noted that such parts are situated within moderate distances from export centres or at least communications to such whether by rail/

rail or inland waterways. Here as elsewhere in tropical Africa railway extension by providing transport will encourage wider cultivation, for reports indicate that there is considerable if scattered production over most of the Territory and that requests for seed are increasing while applications for advice as to the possibility of cultivation reach the agricultural authorities from areas where no crop is at present raised.

North of the Central Railway there is danger of the second rains interfering with the ripening of the bolls. It is possible, however, that even in northern Tanganyika the Nyasaland type of Upland cotton, the variety which is now exclusively grown, may be found to thrive; reports of failure in the north were almost exclusively based on the results obtained from Egyptian cottons. The seeds of Nyasaland Upland Cotton are obtained from Uganda, the name Nyasaland being due perhaps to an earlier connection with that Protectorate.

Even more than in Nyasaland experiment as to methods of cultivation, and especially as to time of planting, is necessary. Sowing begins in April and picking begins in late August. The cotton specialist now in the Territory recommends the evolution of a type which will stop growing and produce its lint in about six and a half months, approximating /

approximating to the regime of the plant in its American home.

Already over half the total production of cotton is produced by the natives, and it is to native production that the Territory must look for increased cultivation. Plantations, whether run by Europeans or Indians, suffer from shortage of labour which means expensive labour, while the presence of tsetse fly, especially in Rufiji and Morogoro, increases this expense by making the use of plough cattle impossible. Plantation production can never yield more than a small percentage of the output the Territory may be expected to contribute to European markets, and, again as in Nyasaland, European activity will be confined to the supplying of seed and the purchase and marketing of the native crop.

Native cultivation is of a low standard. "Shambas" (little holdings) are generally worked by hand implements, and most of the land is not kept under permanent tillage. On the other hand the natives are receptive and carry out the instructions of the few available agricultural officers. The policy of the government is to encourage native production of cotton of the best quality where it does not endanger production of native foodstuffs and in localities where transport facilities are available. Agricultural officers impress upon native cultivators the necessity for carrying out instructions fully in order to safeguard their crops in their own interests especially against the pink bollworm which has appeared /

appeared in certain districts.(1) In 1924 the largest native production took place in the districts of Mwanza (including Shinyanga), Morogoro, Lindi, Rufiji, Kilwa and Bagamoyo; and the percentage of native-grown cotton increased from 42.8 in 1922-23 to 64.3 in 1923-24.(2) The shamba owner has troubles of his own to face for not only is the growth of weeds prolific, but the depredations of wild animals - elephants buffaloes, hippopotami, elands, and pigs - cause considerable havoc. Perhaps the preservation of these destructive pests is carried to excess by government regulations. The European and native alike suffer from lack of transport, but while the former will benefit very largely from the proposed railways shown on the map (~~fig.6~~ p.269), the latter has special difficulty in such a district as Rufuji where an ideal cotton tract is served only by dug-out canoes which carry small loads to Arab dhows at the river mouth. The dhows convey the cotton to steamers at Dar-es-Salaam. Such methods apear to make freights excessive should Manchester prices fall.

A desire to exploit the country too rapidly brought disaster to the Germans who suppressed with difficulty the native rebellion of 1905-6. It is for us to develop the Territory slowly and steadily.

(1) Colonial No.11. p.47.
(2) Ibid.

NYASALAND

Cotton growing was introduced into Nyasaland about the year 1900, and by 1911 the acreage under the crop was nearly 23,500, yielding not far short of 1,500,000 lbs of lint. During the War in East Africa cotton cultivation was interrupted in favour of the growth of foodstuffs for the troops, and tobacco was a more profitable crop in 1919. By 1920 over 18,000 acres were planted in cotton and the crop was not far short of 1,000,000 lbs. Recovery has continued steadily, and in 1924 2,230,000 lbs. were exported. Thus the War period has been already safely surmounted.

Cotton may be grown everywhere in the Protectorate between 100 and 3,000 feet above sea-level,(1) but as a matter of economics cannot be profitably raised in bulk far from the railway. Thus in Nyasaland, as in so many portions of the Empire, lack of railway transport facilities hinders development, and in conjunction with the cost of feeder transport and shipping freights, limits the cultivation of the fibre. Head transport is still common, native carriers bringing in packages of about 45 lbs. to the buying markets - an average distance of 7½ miles; or transporting loads of 60 lbs. at from ¼d. to ½d. per 100 miles, (that is 5.6 to 11.2d. per ton mile) - at about half such rates if a return load is available. Tsetse fly and East Coast Fever have greatly reduced the

employment /

(1) The area included between these heights is not determined.

employment of ox-wagon transport; motor transport costs about 2.4s. per ton mile; hand-carts pulled by natives may become general if roads and bridges are improved. Railway transport is considered later. (pp.284-5)

Roughly 80 per cent of the cotton crop is grown in plantations owned by Europeans. Such plantations are laid out on the higher lands (but below 3000 feet) south of Lake Nyasa. Generally the soils are red and in some parts very fertile owing to a large content of organic matter. Seed is sown in November and December - reckoned early in Nyasaland, but necessary if the crop is to ripen before the weather turns cold. Damage to the young crop from the heavy rains is a serious risk towards the limit of elevation, and the safest areas are between 1000 and 2000 feet. Such areas lie for the most part at some distance from the railway and in parts are infested with tsetse fly. At these mean levels of cultivation the sowing season is slightly later, and still lower, in the extreme south (Port Herald district) the seed is not sown till March when the Shire floods have subsided. The crop here depends entirely on the late rains, and their failure ruins the whole harvest. The rains cease about the end of March. As the crop is not ready for sale till near the end of June, it has to endure a long period of dry weather just when moisture is most /

ost necessary to swell the early bolls and set those that form ater.

Cultivation is extensive and hence scanty and careless. nsect pests (especially red bollworm, Diaropsis castanea) nd diseases (of which bellrot is the most serious) are rife - result due partly to unhealthy crops, partly to poor seed. uch remains to be done experimentally in connection with the roper sowing period and the selection of seed varieties, as ell as educationally as regards methods of cultivation, the alue of rotation crops, and the use of manures, especially attle manures. These matters are now being taken in hand. n 1922 the Empire Cotton Growing Corporation lent the services f two cotton specialists for a limited period, and during 923 added an entomologist and an agriculturist to take harge of the experimental farm it was proposed to inaugurate (1) The entomologist devoted his time entirely to a study of the ed bollworm, which was specially destructive during 1923 with he result that the yield per acre was very low. (2)

In a Report to the Empire Cotton Growing Corporation ollowing a tour through Nyasaland in 1921 Mr H.C.Sampson tates that the future of cotton growing lies with the native ho alone can develop successfully the less temperate regions here /

(1) Col.Rep. No.1204 p.6.
(2) Report of Agric.Dept.Nyasaland.

where cotton is likely to thrive best.(3) To the native the principal incentive to cultivation is the assurance of a fixed price for his crop. An agreement between the Nyasaland government and the Corporation has led to the fixing of a standard price for five years and the result is shown by increased native cultivation.(4) For development work propaganda is necessary, and that in turn is proportionate to the funds and trained staff that can be provided. At present the quality of the fibre produced reflects the poorness of the cultivation. The natives, particularly the Yaos who live between Zomba and Lake Nyasa, are generally indifferent cultivators. On the other hand the highland Angoni are much more industrious and in the Ncheu district of the Upper Shire native cultivation is progressing; but some of the Lake peop le who seem to be still better cultivators suffer meantime from absence of communications by which to market any crop.(5) Ultimately it is probable that the European will do the handling and export of the crop raised by the natives for cultivation by the natives is extending; and the cost of native /

(3) "The development of the cotton industry here as elsewhere must mainly follow the lines of production by natives as peasant proprietors, each cultivating his small patch and selling the proceeds to middlemen." (Col.Rep.No.1204 p.6) I n 1922, however, 90 per cent of the cotton was grown by Europeans. (Brit.Empire Exhibition handbook p.16)

(4) "From 250 native planters in one district in 1923 the number has increased to over 1,500 in 1924. (Cotton Buying in Nyasaland by J.A.Lee. E.C.G.R.,Vol.II, No.1.p.10)

(5) Motor transport from Fort Johnston to Limbe (just over 100 miles) c osts £12 per ton (Mr Sampson's Report p.18).

native labour enhanced by the influx of post-war settlers has led, temporarily at least, to a shortage of plantation labour.

Any valuable increase in the output of cotton is possible only if internal transport, railways, and shipping can be improved and their rates reduced.

NORTHERN RHODESIA

Small quantities of cotton are produced in two separate areas of Northern Rhodesia. One area of cultivation stretches along the railway between Livingstone and Broken Hill where some European farmers have raised crops on their farms. Experiments have been conducted by the Agricultural Department at Mazabuka about 180 miles along the line from Livingstone, but on the whole results were unsatisfactory and at best, owing to rainfall variations, the crop is speculative. Ginneries have been erected at Mazabuka and Pemba and the estimated crop for 1924-25 shows a large increase over that of the previous year.

In the south-east of the Colony cotton is grown in the neighbourhood of Fort Jameson, where possibilities appear to be limited only by lack of cheap transport (1) and the presence of the red boll-worm (cf. Nyasaland). When the line to Manda is opened (Fig.No.6) and a good road laid to Domira Bay, Lake Nyasa, transport for this area will be cheapened and export increased/

(1) Part wagon, part motor-lorry transport from Fort Jameson to the nearest station on the Nyasaland railway is rather over 2½d per lb of lint. (Cotton Growing within the British Empire by L.G.Killby, E.C.G.R. Oct.1924, p.271.

increased, or alternatively the line in Nyasaland might be extended northwards to the Lake.

With its communications the western area appears to favour more rapid development especially if cultivation is scientifically adapted to rainfall conditions which are particularly difficult in January and February when precipitation is heavy.

SOUTHERN RHODESIA

Cotton is a new factor in the economic development of Southern Rhodesia. The shrub may be grown by European farmers at elevations of between 3000 and 4000 feet; it thrives best on light sandy loams in succession to tobacco; it is mainly cultivated in proximity to railways. Planting coincides with the commencement of the rainy season in November or early December; growth continues till April; and the bolls mature in the period of sunshine with little rain, for harvesting in the practically rainless period lasting through May, June and July. Though light frosts may be experienced from May to August, and June and July are the coldest months, the thermometer seldom falls more than 5° below freezing point over extended areas. An experimental station has been opened (1925) in Gatooma on the railway about 100 miles south-west of Salisbury and its work will be reflected over the colony. The normal mean monthly rainfall over Western Mashonaland in which the experimental /

experimental station of Gatooma is situated is as follows -

ly to Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mch.	Apl.	May - June	Year
0.25	1.02	3.65	5.81	7.57	7.30	4.14	0.93	0.41	31.08
		Sowing						Harvest	

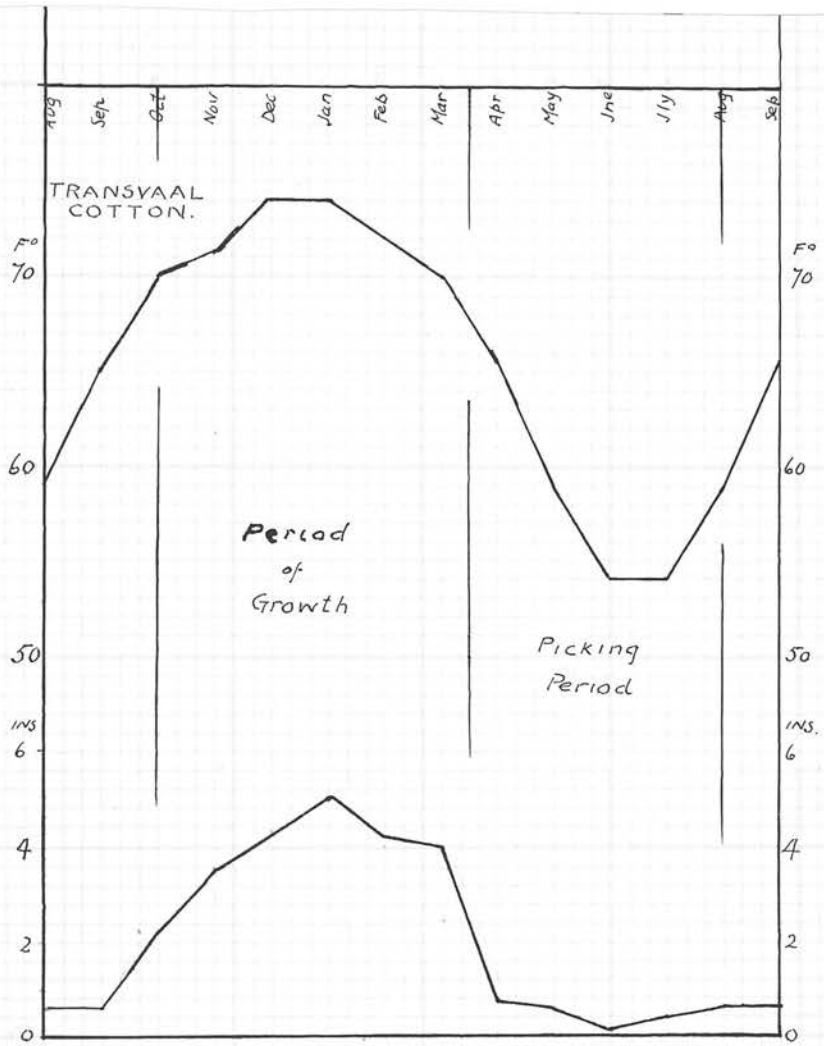
Spasmodic efforts to encourage the crop were made from 1903 onwards, but the discouraging results, ~~mainly~~ due mainly to ignorance of practical details, did not lead to any advance. On the other hand the experience gained through failure was valuable, and following the appointment of a cotton expert in 1918 renewed interest was awakened. Owing, however, to indifferent cultivation and unfavourable weather, aggravated by lack of proper gins to prepare the crop, propaganda work was unsuccessful and in 1922-23 only 21 acres of experimental plots were sown. The following season was unfavourable; short rains were distributed erratically and the first rains were exceptionally late. Yet the crop was 1650 bales of 400 lbs. Ginneries, capable of dealing with 50,000 bales in the space of three or four months, have been erected(1926) in the Gatooma, Bindura, and Lomagundi areas.(1) At present the European farmer monopolises production, but undoubtedly the native will undertake its cultivation.(2) By the bridging of the Limpopo river at Messina Southern Rhodesia will be br ought into closer touch with Delagoa Bay and Durban.

(1) Report of Empire Cotton Growing Corporation, 1926.
(2) Announced March 1926.

THE UNION OF SOUTH AFRICA

During the great cotton famine of the American Civil War period spasmodic attempts were made to grow the cotton plant in South Africa, but there as elsewhere cultivation practically ceased when "normal" conditions again obtained, and the United States' supplies brought a sharp fall in prices. In South Africa resumption of cotton cultivation dates back about fifteen years. According to the Agricultural Department of the Union production did not reach one hundred bales until 1914 when the output was 142 bales; in 1919 over 1000 bales were registered, and the figure for 1923-24 was 8730 bales. In that year South Africa took the sixth place among Empire producers.

There are two main regions of production within the Union. The first extends from the Zoutpansberg along the low country to the east of the Drakenberg Mountains into Zululand, the principal centres being Bushy Park in the Spelonken area, Tzaneen Leydsdorp and Acornhoek, all along the railway from the Limpopo to Komatipoort; Nelsprint, Barberton and Malelane on the line from Johannesburg to Komatipoort (Transvaal); Swaziland, especially round Bremersdorp; the Vryheid District, near Eshowe, and the Tugela River Estate, in Natal. The second region is the upper Limpopo valley in the Transvaal districts of Rustenburg and Waterberg. The former region is /



Average Conditions for Rustenburg, Transvaal.

Fig. ~~5~~ 24

is generally less than 2000 feet above sea-level; the latter rises to 3500 feet in the north of the Rustenburg District.

At such altitudes it is necessary to sow sufficiently early to escape autumn frosts, and October is the month chosen. Meteorological records are scanty for the regions and therefore there is much experimental cultivation. Generally the rainfall varies from over 35 inches in Zululand - rather heavy for cotton growing - to less than 20 inches in the Rustenburg-Waterberg tract - rather light for the crop. It is possible to supplement the smaller rainfall tracts by irrigation, and such work would add to the security of the crop, but for financial reasons these schemes must wait, and if they were established it seems probable that cultivators would prefer to raise other crops than cotton. Summer temperatures are everywhere suitable. There is, however, considerable liability to sharp, destructive local hailstorms which occur in early summer and again in autumn (March); against these there is no protection, but fortunately their blighting effect is limited in any district. Among insect pests must be reckoned the locust.

Much scientific study of soils is necessary to determine the most suitable fields and methods of cultivation. South African farmers are only beginning to understand the class of soil best adapted to cotton, while they have been indiscriminate/

indiscriminate in their selection of seeds.

Kaffirs supply the labour in practically all the Transvaal fields. Much of the land is owned by Land Companies but unofficially settled by native squatters who supply labour in lieu of rent. Encouragement of cotton cultivation is necessary, for the coloured peoples prefer to grow maize; in Swaziland and Zululand the natives know little about the growing of cotton and are conservative and suspicious of innovations. In the two areas just mentioned field labour is supplied by native women because the men have no desire to work. To secure money the Kaffirs may easily obtain employment in neighbouring farms, in the mines, or in the towns. In South Africa cotton cultivation is likely to be a white man's business carried on by native labour which is generally ample at a moderate cost.

The Empire Cotton Growing Corporation's specialist estimates[1] that within twenty years some 290,000 bales could be produced annually if suitable encouragement is given to the cultivators. Thus once more the necessity for scientific workers arises. Should this demand be satisfied there appears to be no reason why the South African output should not only increase but be extended to other areas over which the soil and climate are favourable.

(1) Rustenburg-Waterberg District, 100,000 bales; Swaziland and the Lobombo Flats, 80,000: Zululand 30,000.

~~202~~

~~35.~~

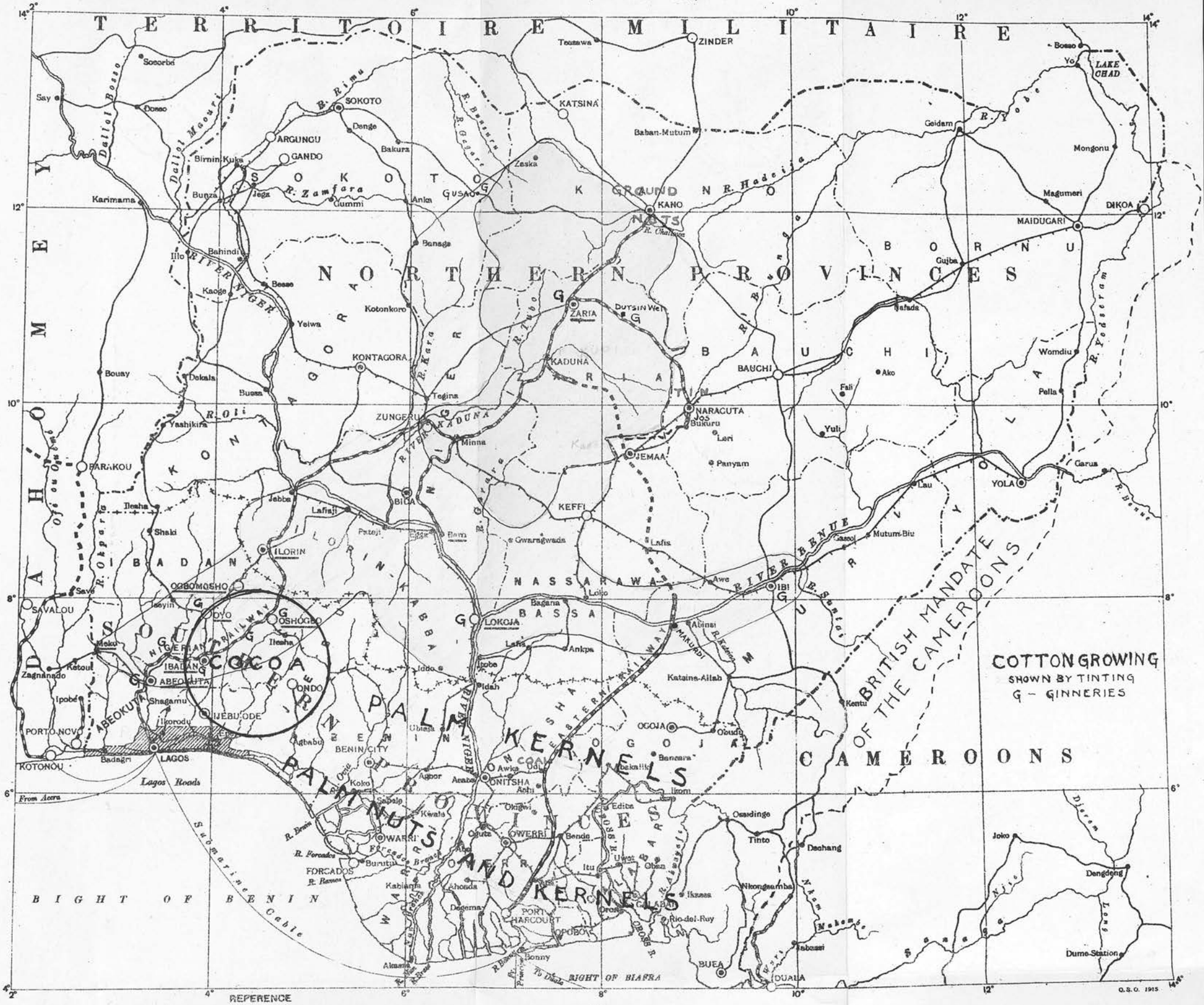
N I G E R I A

Although the Yorubas of the Southern Province and the Hausas of the Northern Province have grown indigenous African cotton for generations, the development of an export trade is most largely due to the efforts of the British Cotton Growing Association. Nigeria is now among the more important of our African Empire sources of raw cotton (Table ~~65~~ 51 p.106) but as the graph (~~Fig. 39~~ p.315) ~~shows~~ indicates, the export from Nigeria does not show any decided signs of increase, especially when compared with such competing crops as cocoa and ground-nuts.

Since the political amalgamation of the Northern and Southern Provinces in 1913 the statistics do not distinguish between the quantities of raw cotton produced in these divisions, but accounts of the occupation of cotton growing, and a study of the varieties of cotton grown bear out the distribution shown on the map (Fig. ~~22~~ 25).

For the production of American long-staple cotton the Northern Province has been found to be well suited, and since the introduction in 1912 of Allen seed from Uganda the crop of this variety has steadily if slowly increased (see Graph Fig. ~~34~~ 19 p. ~~45~~ 92). It is cultivated most largely in the province of Zaria where soil and climate are well adapted to its growth. It is sown in July during the wet season, and is ready for picking /

NIGERIA,


TERRITOIRE MILITAIRE
NORTHERN PROVINCES
BRITISH MANDATE OF THE CAMEROONS
CAMEROONS
SOKOTO
KANO
ZARIA
KADUNA
BAUCHI
NARACUTA
JEMAA
KONTAGORA
ZUNGERU
BIDA
KEFFI
NASSARAWA
YOLA
MAIDUGARI
DIKOA
ZINDER
KATSINA
SOKOTO
ARGUNGU
GANDO
BIRNIN-KUKA
KARIMAMA
SAY
DOSSO
SOKOTO
BUNZA
JEGA
GUMMI
ANKA
GUSAU
BANSARA
BAHINDI
ILLO
BESSE
KAOGE
KOTONKORO
YELWA
BOUAY
DEKALA
BUSSA
TEGINA
YASHIKIRA
ROLI
PARAKOU
JABBA
LAFIAJI
BIDA
PATEJI
BAM
GWARAGWADA
MINNA
ZUNGERU
KEFFI
LAFIA
PANYAM
LERI
BUKURU
JOS
YULI
LAU
GARUA
MUTUM-BIU
JAMA'A
AWE
IBI
ILORIN
OFFA
OJI OU OGUMBO
SAVE
SHAKI
ISEYIN
OYO
OSHOGBO
OGBOMOSHO
ILESHA
MEKU
IBADAN
ABEOKUTA
ONDO
IJEBU ODE
SHAGAMU
IKORODU
IPOBE
ZAGNANADO
KETOU
PORTO-NOVO
KOTONOU
BADAGRI
LAGOS
ABEOKUTA RAILWAY
NIGERIAN RAILWAY
EASTERN RAILWAY
MAIN RAILWAY
COCOA
PALM KERNELS
PALM NUTS AND KERNELS
COAL
TIN
LOKOJA
BASSA
AGBABU
BENIN CITY
AGBOR
ONITSHA
AWKA
UDI
ACHI
OGOJA
OBUDU
BAMENDA
KATAINA-AILAH
KENTU
ABINSI
MANURDI
IBEKWILIKI
IKOM
OKIGWI
EDIBA
OWERRI
OKUTA
BENDA
UWET
OBEN
ITU
IKANA
ORON
CALABAR
OPOBO
PORT HARCOURT
DEGEMA
AHOADA
KABIAMA
BURUTU
WARRI
SAPELE
KOKO
FORCADOS
R. FORCADOS
R. BRASS
BONNY
ALAKIRI
RIO-DEL-REY
TINTO
OSSIDINGE
DSCHANG
NKONGSAMBA
MBAM
MOKAMO
TABOSSI
DUALA
BUEA
DUMA STATION
DENGDENG
JOKO
DJEREM
MAYO LOUE
MAYO KEBBI
MAYO GOTHLON
MAYO KARA
MAYO KADUNA
MAYO LAMIDO
MAYO GANA
MAYO GWOI
MAYO DOKA
MAYO GOMBE
MAYO GUMSA
MAYO GUMTI
MAYO GOTHLON
R. RIMA
R. ZAMFARA
R. GADABEDJI
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picking six months later. Many reasons are given for the slow rate of increase of production, but it seems evident that many causes combine to hinder development. Native cultivators, chiefly Hausas and Fulani, under the scientific guidance of t h e Director of Agriculture and his staff, are alone concerned in growing the crop, which is produced at the same season as the foodstuffs for the population. And there is competition not only between cotton and millet (the staple food grain), but between cotton and ground-nuts. Mr Lamb, the Deputy Director, has prepared the following table (1) the figures in which are based on twelve years of actual farming in the Zaria cotton belt. Transport to market, being a variable

Table 54

Crop	Approximate Yield per acre	Present Price	Approximate Value (per lb.)	Gross Return (per acre)	Cost of Production (per acre) (Labour at 7d. per day)	Profit	Return to native per man day
let	1800 lbs. (in ear)	2/-per 60 lbs.	0.4d.	£3	£1:6/6	£1:13/6	16d.
und-ts	1500 lbs (in shell)	£10 per ton	1.0d.	£4:14/-	£3:7/6	£1:6/6	10d.
	1050 lbs (decorticated)						
ton	200 lbs. seed cotton	3d. per lb.	3.0d.	£2:10/-	£1:10/-	£1	12d.

ge, is not included. When it is taken into account the

ntage/

(1) Cotton Growing in Nigeria (E.C.G.R. July 1925 p.189).

advantage of cotton, the more valuable crop, over ground-nuts becomes apparent, especially as cotton is grown on land at some distance from the railway, along which millet is cultivated. On the other hand rail transport favours the cheaper crop which demands cheap carriage. Ground-nuts are grown very extensively north of Zaria where a more sandy soil and less reliable rainfall are adverse to cotton. In addition to the labour required for millet, a necessity for food, and ground-nuts, an easily cultivated money-crop, cotton cultivation suffers from the lack of other than hand implements for agriculture. It is uneconomic either to feed cattle all year round to draw a plough for four or five months during the rainy season (since the land is too hard for ploughing at any other time); and the nature of the rainfall, which descends in very heavy showers, precludes the cutting of long furrows along which the rain would wash away the soil and the plant food it contains. Another difficulty is that of feeder transport - how to get the crop from the farm to the railway or river at a cost which will still allow the native cultivator a fair return for his labour. Above all, the great desideratum in Nigeria is to increase the yield per acre and improve the quantity and quality of the lint. To secure these an additional staff of botanists and the establishment of more seed farms are essential.

It has been urged that cotton might be raised in large quantities /

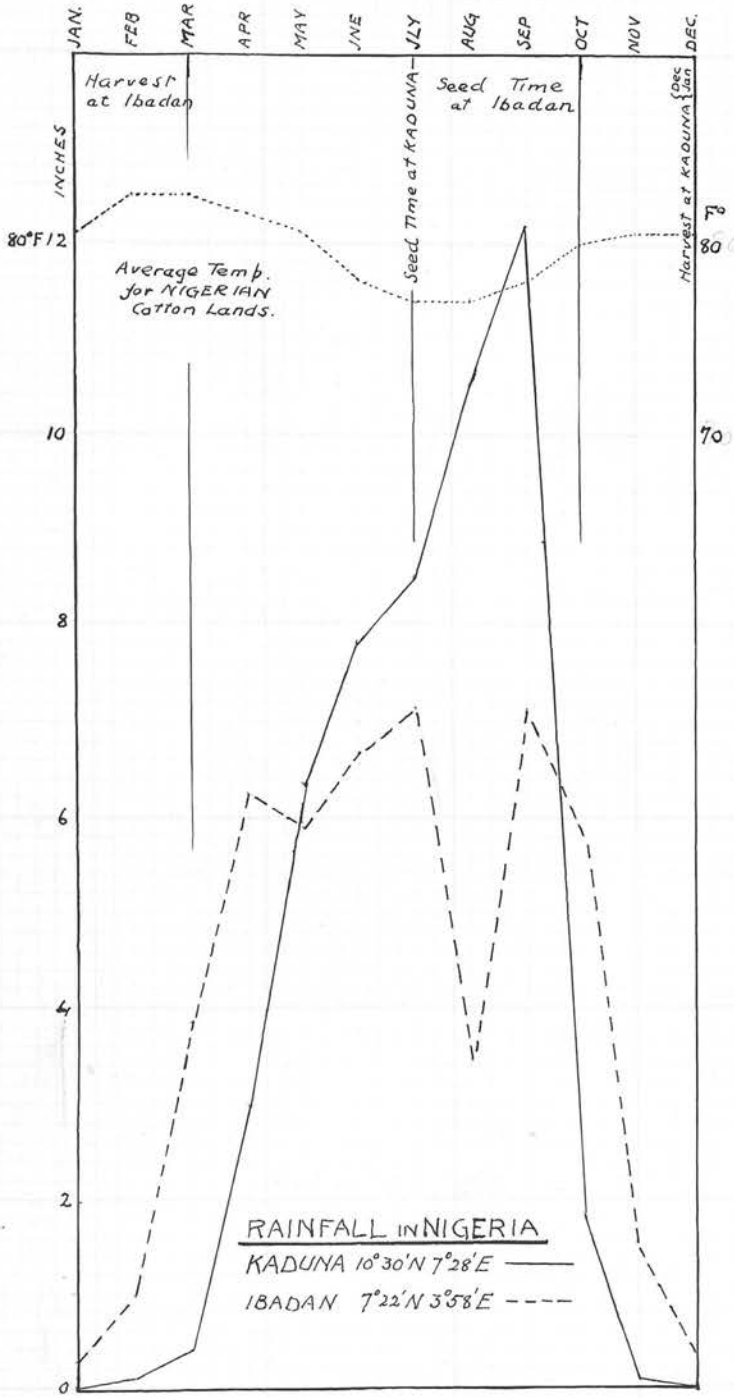

JAN.
FEB
MAR
APR
MAY
JNE
JLY
AUG
SEP
OCT
NOV
DEC.
Harvest at Ibadan
Seed Time at Ibadan
Seed Time at KADUNA
Harvest at KADUNA (Dec Jan)
INCHES
°F
80°F 12
10
8
6
4
2
0
80
70
Average Temp. for NIGERIAN Cotton Lands.
RAINFALL IN NIGERIA
KADUNA 10°30'N 7°28'E
IBADAN 7°22'N 3°58'E

Fig. ~~34~~
26

quantities in the Lake Chad area and in the Sokoto country. In both of these, however, the Sahara is surely encroaching, and the burning Harmattan wind leads to desiccation and sterilisation of the soil. The Lake Chad region in northern Bornu may be meantime omitted from any consideration so far as cotton is concerned; but the district between Jega in south-western Sokoto and Yelwa in Kontagora deserves careful scientific examination. An irrigation engineer from South Africa has been engaged by the Government to report on the feasibility of utilising the Kaduna and Niger rivers to irrigate the regions to the south of Zaria and near Yelwa respectively for cotton growing. If his report is satisfactory production will be greatly increased. If it is found that cotton can be successfully grown, improvements might be made in the Niger waterway, or a railway might be constructed from Jebba to facilitate export. Following the erection of a ginnery at Gusau and the prospects of railway extension in eastern Sokoto, seed has been distributed as far west as Bakura. It is hoped to export some 10,000 bales from this area in the course of two or three years.(1)

In Southern Nigeria cotton is produced on a large scale only in the district of Oyo, where cultivation is carried on in a belt stretching 25 miles on either side of the railway from Abeokuta to Oshogho. Formerly the belt extended as far as Lagos, but as the map shows this is now the cocoa area, and competition/

(1) Agric.Rep.Nigeria 1924.

competition as well as climatic conditions have driven cotton inland. In 1925 the Empire Cotton Growing Corporation removed their ginneries from Abeokuta and Eruwa Road and erected one at Gusau in eastern Sokoto, the other at Detsin Wei in the north-east of Zaria (see map. fig. 25).

Indigenous cotton is mainly cultivated (1) for the Yorubas grow their cotton thinly amongst yams or with corn. Acclimatised Allen seed is available, but experimental tests to secure the most suitable exotic cotton have not yet been concluded.

The central belt extending northward from Lokoja to Minna and including the districts of the Niger and Benue valleys, is thinly populated and not very productive of trade commodities. American varieties are being tried, but it has been suggested that G.peruvianum from South America might prove more suitable.

For the future extension of cotton growing in Nigeria improved varieties as well as improved cultivation and transport are necessary. "I cannot too strongly emphasise the paramount importance of raising the general standard of the crop both by substituting American for native varieties wherever possible, and by the institution of scientific selective breeding, with the object of eliminating the tendency to degeneration inherent in exotic types and of evolving/

(1) "In the Northern Belt over 10,000 bales of American cotton were purchased in 1922-23 and no native cotton; in the Middle Belt the purchases were 479 bales of American and 1,179 bales of native, while in the Southern Belt only 40 bales were American and 4,355 were native."
("Cotton Growing within the British Empire" by L.G.Killby, E.C.G.R.Oct.1924 p.272)

evolving in due course a strain of American cotton which shall be as much at home in Nigeria as its progenitor seed was at home in Mississippi or Tennessee.....What we have to do is to try and breed a strain of cotton valuable enough to be worth carrying not only when prices are high, but when they are low, and not only where transport is comparatively cheap, as in the north, the land of pack animals, but where it is comparatively costly, as in the south, the land of motors and of human porterage."(1)

There is a considerable industry of native home-spun goods for which indigenous cottons are used. Hence the growing of such crops still pays the native and will continue to do so until the price of Lancashire's wares undercuts native manufactures. If such a result should be reached the growing of American varieties would be encouraged since these alone would be marketable at a fair price.

These factors serve to show why, despite Nigeria's proximity to Liverpool, her exports of raw cotton compare so unfavourably with those of the less accessible fields of East Africa.

(1) Report by Sir Hector Duff to the Empire Cotton Growing Committee 1921 pp.15 and 25.

GOLD COAST

In the Gold Coast, as in Sierra Leone, the pioneer efforts of the British Cotton Growing Association to establish cotton growing commercially were unsuccessful. Some native cotton is grown, and an attempt to develop cultivation in the Togoland Mandated Territory is being made by the local Agricultural Department. Under irrigation cotton could be profitably grown along the lower reaches of the Volta River where export facilities are good. Large scale production would ensure systematic cultivation, independently of climatic conditions .

SIERRA LEONE

Native grown cotton in Sierra Leone has a staple of about one inch. Five tons of the best Allen long-staple American cotton seed were imported into the Colony in 1923-4, and distributed to Chiefs and people in areas which were considered most suited to the crop. The Imperial Institute reported favourably on the crop, and cotton cultivation on a more extensive scale is being undertaken.(1) Further developments must be contingent on improved communications.

(1) Col.Rep. No. 1219, p.18.

THE BRITISH WEST INDIES

These islands now practically monopolise the production of Sea Island cotton, the long silky staple of which was in great demand for certain special uses. This cotton thrives under moister conditions than other species, and appears to benefit from the saline atmosphere and soils of island and littoral locations. It was originally introduced into the United States from the West Indies, and production, especially along the coast of South Carolina, rapidly increased. From 1896 to 1916 the average annual production in the United States was approximately 90,000 bales, but the appearance of the boll-weevil in the Sea Island district in 1916-17 led to a rapid decline of the crop. From 52,208 bales in 1918 production declined to 785 bales in 1923 and up to mid-January 1925 only 5 bales had been ginned from the 1924 crop.(1)

Development of the Sea Island cotton-growing in the West Indies has been marked in St.Vincent, Montserrat and Nevis, while in St.Kitts, Antigua, Barbados and the Virgin Islands it is a valuable subsidiary industry. Undortunately the demand for luxury cottons has been curtailed, and the consequent depression in Lancashire has adversely affected purchases of Sea Island cotton. Hence though the West Indies could readily double its output of 4000 to 5000 bales of the finest cotton grown in the world the lack of demand, aggravated as it has been by bad seasons since 1920, is tending to/

(1) Times Trade Suppt, June 6, 1925. p.285.

to lead to abandonment in the Leeward Islands.[1] Moreover to such economic difficulties hasbeen added the pink boll-worm which, making its appearance in Barbados in 1920, has spread through the cotton-growing islands. The Department of Agriculture immediately took steps to check its ravages and the damage to crops has not assumed alarming proportions.

Endeavours to help growers by introducing other types of long-stapled cotton which should secure a wider market, have been made by the Imperial College of Tropical Agriculture in Trinidad.

(1) Report on the West Indies D.O.T.1924 p.13.

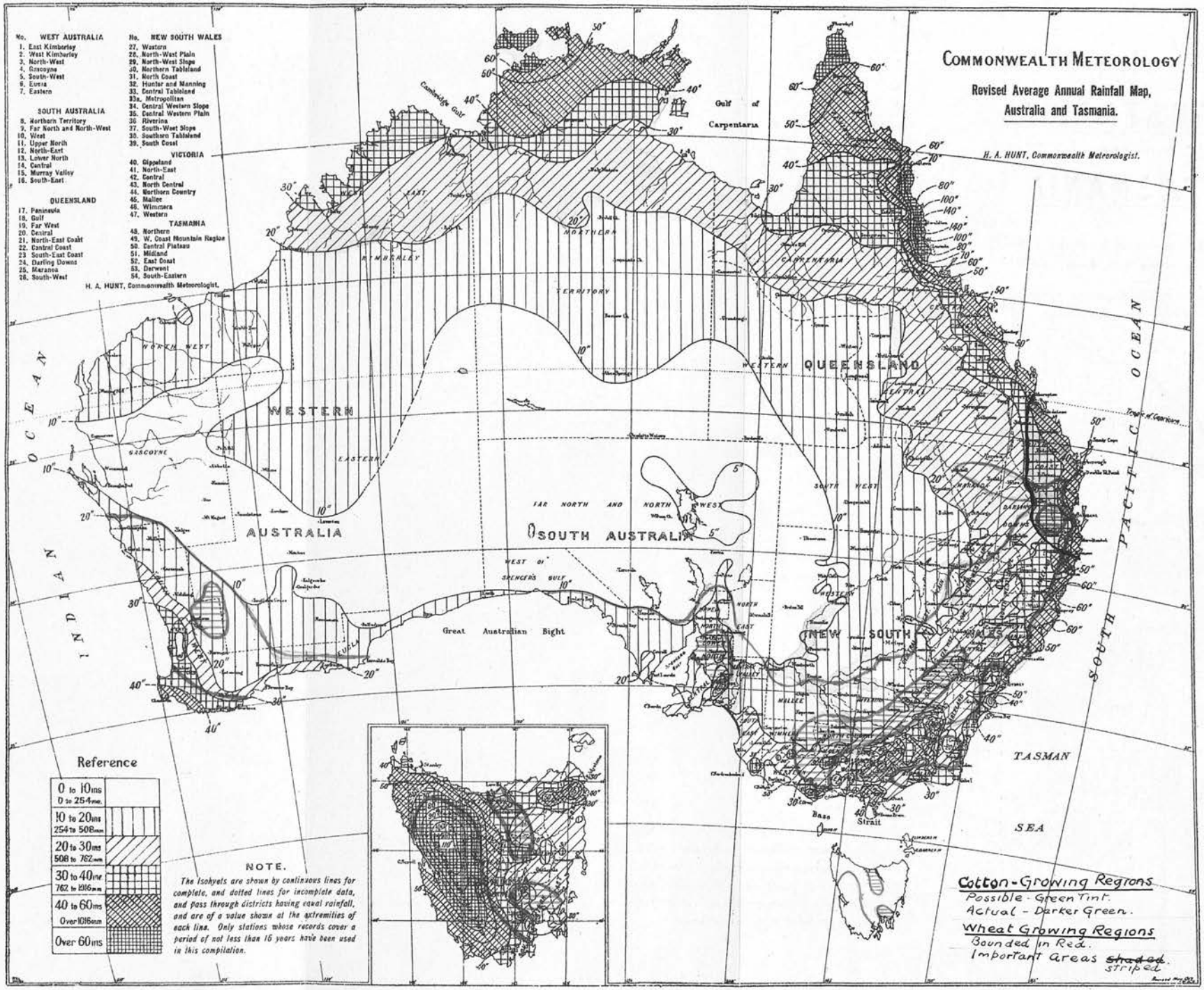
AUSTRALIA

Present endeavours to develop cotton-growing in Australia represent the third great attempt in the Commonwealth. During the famine of the American Civil War period (1861-5) cotton was successfully raised, but cultivation lapsed when Liverpool prices fell. A second effort was made in 1890, but this was of short duration. "In 1913 the Department of Agriculture, in conjunction with the British Cotton Growing Association, again drew attention to cotton, and since then some progress has been made."(1)

This third period has thus given rise to a de novo study of Australian conditions for cotton growing - a study based on climatology and soils. "A comparison of climates shows that many parts of the States of Queensland and New South Wales are more suited to cotton than either the Nile Delta of Egypt or the United States of America.....Not only can Australia with her white labour successfully compete in open markets but.....she is eventually destined to become one of the great cotton-producing countries of the world."(2) Such statements, in view of Australia's present crop in relation to the price of raw cotton, seem extravagant, and it will serve more purpose to examine the situation of the post-war fields and in how far these may be extended under possible increase of population with probable fall in prices.

Hence /

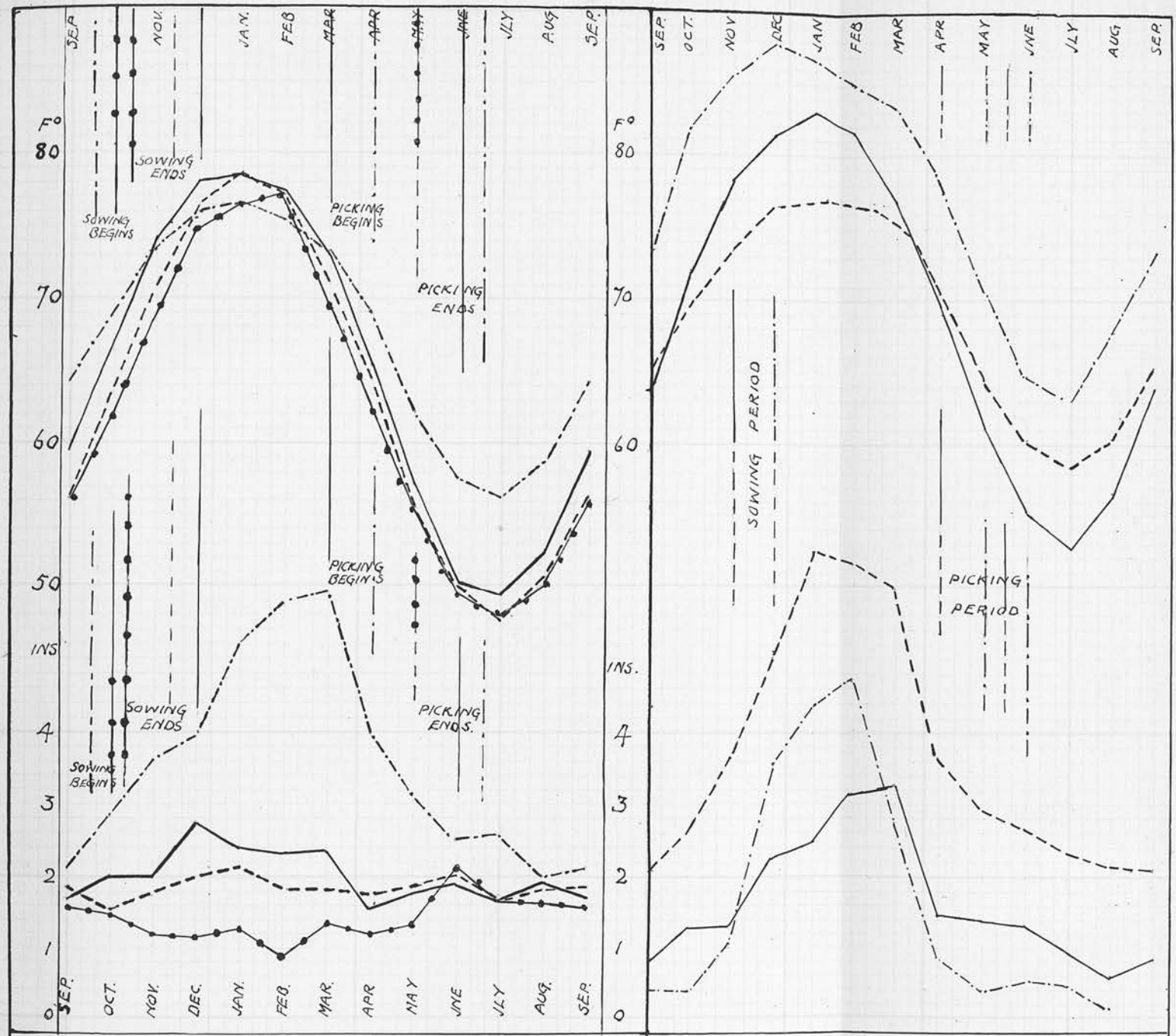
(1) Cmd 523 p.47. (2) "Cotton in Australia"(Harding)Preface p.XII.


COMMONWEALTH METEOROLOGY
Revised Average Annual Rainfall Map, Australia and Tasmania.
H. A. HUNT, Commonwealth Meteorologist.
No. WEST AUSTRALIA
1. East Kimberley
2. West Kimberley
3. North-West
4. Gascoyne
5. South-West
6. Eucla
7. Eastern
SOUTH AUSTRALIA
8. Northern Territory
9. Far North and North-West
10. West
11. Upper North
12. North-East
13. Lower North
14. Central
15. Murray Valley
16. South-East
QUEENSLAND
17. Peninsula
18. Gulf
19. Far West
20. Central
21. North-East Coast
22. Central Coast
23. South-East Coast
24. Darling Downs
25. Maranoa
26. South-West
No. NEW SOUTH WALES
27. Western
28. North-West Plain
29. North-West Slope
30. Northern Tableland
31. North Coast
32. Hunter and Manning
33. Central Tableland
33a. Metropolitan
34. Central Western Slope
35. Central Western Plain
36. Riverina
37. South-West Slope
38. Southern Tableland
39. South Coast
VICTORIA
40. Gippsland
41. North-East
42. Central
43. North Central
44. Northern Country
45. Mallee
46. Wimmera
47. Western
TASMANIA
48. Northern
49. W. Coast Mountain Region
50. Central Plateau
51. Midland
52. East Coast
53. Derwent
54. South-Eastern
H. A. HUNT, Commonwealth Meteorologist.
INDIAN OCEAN
SOUTH PACIFIC OCEAN
TASMAN SEA
Gulf of Carpentaria
Cambridge Gulf
Great Australian Bight
Bass Strait
NORTHERN TERRITORY
WESTERN AUSTRALIA
WESTERN QUEENSLAND
NEW SOUTH WALES
SOUTH AUSTRALIA
FAR NORTH AND NORTH WEST
WEST OF SPENCER'S GULF
GASCOYNE
EUCLA
MALLEE
Reference
0 to 10ins 0 to 254mm.
10 to 20ins 254 to 508mm.
20 to 30ins 508 to 762mm.
30 to 40ins 762 to 1016mm.
40 to 60ins Over 1016mm.
Over 60ins
NOTE.
The Isohyets are shown by continuous lines for complete, and dotted lines for incomplete data, and pass through districts having equal rainfall, and are of a value shown at the extremities of each line. Only stations whose records cover a period of not less than 16 years have been used in this compilation.
Cotton-Growing Regions
Possible - Green Tint.
Actual - Darker Green.
Wheat Growing Regions
Bounded in Red.
Important Areas ~~shaded~~ striped.

Hence although the map (fig. 27) shows a vast area of northern and eastern Australia as a potential cotton land, so far, that is, as meteorological records indicate, but not taking into consideration elevation or soil factors, the actual fact is that only a small portion of this area, stretching from perhaps Rockhampton to central New South Wales, at present produces cotton. On Dec.19, 1923 a small quantity of cotton grown in Western Australia, virtually the first export from that state, was sent to London for exhibition. From another point of view it may be said that while there are some 375,680,000 acres (1) capable of growing the fibre the cropped acreage was estimated at 40,000 in 1923. If one-fifth of the potential acreage were actually cropped, the world's supply would be assured: for cultivation alone this area would demand six times the present population of the Commonwealth.

Following the examination of soil properties and meteorological data, scientists suggest the variety of cotton that may be grown, and it is a matter of experiment to evolve a species suitable forthe area. Figure 28 shows the temperature and rainfall of stations in cultivated regions with the calculated dates of sowing and picking. Ultimately an Australian cotton may be evolved that will fully satisfy these conditions and yield a good return to the cultivator. It appears that areas may be selected on which the finest Sea-Island, Egyptian, and long-staple American Uplands may be grown/

(1) Harding op.cit. p.74.



COTTON GROWING IN N. S. W.

QUEENSLAND.

grown. There is, however, a considerable mixture of varieties of cotton seed in the fields, so that the quality of the pickings is very unequal. Another hindrance to good quality is that in many cases the farmer sows a larger area than he can cultivate carefully, and pests spread throughout. The general absence of frost in Queensland led farmers to allow the cotton plants to grow throughout the year, and pick a second crop in the following year. It has been found that such ratoon cotton is inferior in quality to the annual fibre, being shorter in staple and lacking in twist. In addition ratooning favours the increase of insect pests which find a winter refuge in the green bolls that the plant produces at that season. Among these pests the Pink Boll Worm becomes a menace, invading fields where annual cotton alone is cultivated. Under the Australian Government's Cotton Industry Act no ratoon cotton may be grown. In the meantime the Australian Government is concentrating on encouraging the growth of qualities in demand by Lancashire.

In Australia the production of cotton for export is governed by the high cost of labour and its shortage, especially for picking, the existence of other competing crops, and the high freights of the long journey to Europe.

Australian cotton is of special interest among Empire grown crops. Australia is the only part of the Empire in which cotton is grown exclusively by white labour; it is also the only part in which cultivation has followed research; and /

nd it shares with South Africa the advantage of putting cotton
n the British market when other supplies are exhausted.
ts future is closely wrapped up with increase of population -
especially of rural population,[1] for the "White Australia"
olicy limits cultivation to Europeans. For them the necessity
is to grow the highest possible grade of cotton (averaging
1 3/16 inch in staple) over a small area (say 20 acres) which
the farmer and his family can manage by themselves. The
growth of post-war output is not convincing: there is a
market for as much cotton as Australia can export. The
exceptional drought of 1923 must not be allowed to dis-
hearten the farmer, nor must the heavy labour required deter
the cultivator.

(1) This question of increasing the number of rural settlers is common to all the Dominions (see under Separate Dominions and under Migration). At present urban population is still tending to increase, despite attempts to foster close settlement in suitable country districts.

I R A q (Mesopotamia)

Though cotton has been grown in Iraq for centuries modern commercial production for export is a development of conditions made possible under the British mandate. From 60 bales of 400 lbs. in 1920-21 the crop reached 1100 bales in 1923-4 and twice this quantity is estimated for the present year.(1)

The population, estimated at less than three millions, comprises mainly town dwellers and roving tribes to neither of whom cultivation appeals strongly. Cotton of suitable staple and excellent quality can be grown, but to secure production irrigation and drainage works of great magnitude are required. Under present political conditions it is not probable that the enormous expense of such works will be met. Even should irrigation schemes be carried through, two other difficulties must be faced. Fertilising silt is transported down the rivers in such quantities as to choke the canals, while the waters are highly charged with salt which, as the result of rapid evaporation over the undrained plain renders the soils so saline as to be useless for cultivation. Alterations in the level of the sub-soil waters have dissolved salt from the impregnated soil and raised it towards the surface.

Thus the soils, calcareous loams rich in plant foods, are in /

(1) Report of the Emp.Cotton Growing Corporation 1926.

in many parts useless for cotton cultivation, and in his Report to the British Cotton Growing Association (1) (June 1925) the General Manager states that cotton possibilities are not important south of Hillah (32° 30′ N). To the north and north-west of Baghdad, and particularly on the land irrigated by the Diala river around Baqubah, less salt is visible, and prospects are promising.

Mesopotamia is frequently compared with Egypt, but the contrasts outnumber the resemblances. Both are oasis lands between desert stretches; both are watered naturally by river floods; the deltas of the Nile and Tigris-Euphrates lie in the same latitudes; both have been described as Granaries of the World. On the other hand Egypt lies south of the Nile delta while Iraq stretches north; Egypt is depndent on a regular river, flooding with only sufficient silt to enrich the summer and winter crops, under a climate of mild winters - a very "garden of the Lord"; Iraq suffers from unruly rivers, bearing five times as much silt as the Nile and large quantities of salt in solution, flooding too late for winter and too early (2) for summer crops, under a climate of great extremes of temperature, - a land of torment. Under these conditions the Turkish misrule that failed to ruin Egypt succeeded in reducing Iraq to a wilderness.

At Baghdad the temperatures range from 40° F in January to 110°/

(1) "Iraq as a Source of Increasing Raw Cotton Supplies" (W.H.Himbury) pp.19,34,39.

(2) As the rivers flood from March to May this statement made by Sir W.Willcocks, is apparently exaggerated. Full summer development is reached in June.

110° F in July, and the Mediterranean rainfall is about 8 inches. Cotton is sown at the close of the rainy season in March and is picked from August till November. The growth is dependent on irrigation. During March, April and May the rivers carry down the waters formed by the melting snows round their Armenian sources, the more southerly Tigris flooding about a month ahead of the Euphrates. To regulate the distribution of these supplies through canals that become choked with silt in a few years and to plan the drainage of the surplus salt-charged waters from the fields is the work of the engineers, - a veritable labour of Hercules and Sisyphus combined. A poor state with a small population cannot finance such undertakings even though it realises that they will bring wealth and settlers to enrich the country. It is well for Iraq to be mandated to Great Britain. From the great Hindiyah Barrage two canals carry the water on each bank; on the left bank Hillah and Georgiyah, and on the right bank Hussainiyah and Beni Hasan, the latter couple irrigating over 150,000 acres.

Under the Cotton Ordinance of 1920 all care is taken to regulate the kind of seed and provide licences for ginning factories. The most successful cotton is Mesowhite (Mesopotamian White) an American Upland staple which has been well reported on. Insect pests are few and not troublesome yet, but spotted bollworm and locusts require to be guarded against. The first ginnery was erected about 1920 at Shaikh Janaid, but in order to deal with increasing production a large up-to-date pneumatic/

plant
pneumatic ginning, together with a standard hydraulic press, was sent to Baghdad in 1924.

Transport is at present adequate. River steamers reach beyond Baghdad, and small craft navigate the Euphrates. Over 400 miles of metre-gauge main lines link the Persian frontier through the capital with Basra, the seaport on the Shatt-el-Arab. For passengers traffic there is a motor service between Beirut(Syria) and Baghdad, 650 miles distant. To the north a British standard-gauge line to Shargat will probably be replaced on the metre gauge.

Given a strong government, definite schemes of irrigation and drainage, Iraq will yet recover its early glory, and the land which gave perennial irrigation to the world, will, by means of it, awake from its desert trance.

C Y P R U S

Figures of production show that the cotton crop is not making headway in Cyprus, yet estimates indicate that nearly

Table ~~69~~ 55

Year	Bales of 400 lbs.	Year	Bales of 400 lbs.
1919-20	3,325	1922-23	1,505
1920-21	2,687	1923-24	2,233
1921-22	2,547	1924-25	3,320

ten times this production is possible. The fibre may be grown under wet or dry conditions. The damage done by pests is not considerable, and there are twenty-six ginning factories to deal w ith the crop.(1) On the other hand reports for the year 1924-25 indicate that the Pink Boll-Worm and the Spiny Boll Worm are attacking the shrubs severely.

For the improvement of the industry the type of cotton most suitable for the island must be determined, and for this purpose the Abbot of Kykko has granted land on which experimental work may be carried out. Progress will continue to be slow until merchants distinguish among the mixed varieties offered for sale, and hold out inducements of discriminating prices to the Cypriot farmers to produce better crops. Much of the local crop is spun at Famagusta.

(1) Annual Report of the Dept. of Agric., Cyprus 1923.

MALTA produces a small crop under rainfall conditions. Short-stapled fibres from Maltese and Levant plants are chiefly grown.

Following the shortage of American supplies in the early 6 0's of last century cotton was grown for export in FIJI. Attempts have been made since the Great War to revive cultivation, but pink boll worm made its appearance in 1922. As the result of the visit of a cotton expert in 1924 it may be anticipated that renewed interest will be evoked, but the lack of demand for Sea Island cotton (see West Indies) may act as a deterrent until other long-stapled varieties are successfully introduced.

Experiments are being carried out to determine the possibilities of PAPUA for the cultivation of Sea Island cotton.

BRITISH GUIANA which grew the fibre a century ago does not now produce cotton for export, partly owing to labour shortage an d partly to the competition of the sugar crop. The local government is at present investigating the possibility of reintroducing the cultivation of the shrub.

C O A L

No commodity bulks so largely in the British export trade s coal which forms 80 per cent of our export cargoes. By alue it forms only about 10 per cent of the total exports of ritish origin, but from its nature it occupies a large tonnage f shipping. For this reason it is necessary to examine the ost-war state of this trade; on it depends in a very large easure the economical carriage of our imports of foodstuffs nd raw materials.

(1)

British Coal Table 56

Period	Average Annual Production (million tons)	Average Annual Output per head employed (tons)	Average Annual Exports (million tons)	Percentage of Total Exports to Production (by value)	Percentage of Total Exports of Raw Materials (by value)	Bunker Exports (million tons)	Average Annual Value (per ton).
909-13	270.	255	65.5	8.8	73.2	19.6	8s.9d.
914-18	250	245	41.5	9.2	78.1	12.8	-
919-23	230	195	47.5	9.2	72.0	14.7	24s.11d.
1924	267	220	61.7	9.0	67.7	17.7	18s.10d.

Over the long period 1855-1920 almost 11,280 million tons f coal have been raised in Great Britain. Available resources ithin the country were estimated by Prof.H.Stanley Jevons n 1915 at 197,000 million tons within 4,000 feet of the urface.

Great Britain has the geographical advantage of proximity f coalfields to sea coast and thus, apart from other factors f production and land transport) can export her surplus more heaply /

(1) Partly based on Coal Tables, 1924 (H.M.Stationery Office).

cheaply than can her greatest competitors, the United States and Germany, whose deposits lie far from the sea-board.(1) In pre-war years her customers were to be found in all parts of the world but especially in lands from which bulky cargoes of food-stuffs and raw materials were obtained. In the accompanying table the changes that have followed the War period, and are, indeed, partly a direct consequence of the War, are apparent.

Coal Exports (by quantity) Table 57

Destination	Percentage of Total Exports 1913	1924
Europe and Mediterranean lands	86.5	87.0
Africa and Asia (exclusive of Mediterranean lands)	3.6	1.8
South America	9.5	7.2
North and Central America	0.2	0.7
Other destinations	0.2	3.3
	100.0	100.0
Total Export(million tons)	73.4	61.7

These figures show the general directions in which British Coal is distributed, but it must be noted that the average annual export has seriously declined since the record export of 1913 though the actual export(2) of 1923 establishes a new record. Since 1923 exports have again decreased. Of the principal Imperial, and most important foreign, customers for our coal in 1924, the shares were as follows -

Total /

(1) Only in the case of the Ruhr coalfield is the distribution really easy: there the river Rhine offers exceptional facilities.

(2) 79.5 million tons (largely due to French occupation of the Ruhr).

Table 58

Exports of British Coal

Empire Lands	1913	1924	Foreign Lands	1913	1924
	1000 tons			1000 tons	
Irish Free State	-	2,472	To France	12,775	14,535
Gibraltar	355	577	" Germany	8,952	6,824
Malta	700	333	" Italy	9,647	6,706
Canada	-	279	" Denmark	3,139	3,670
Ceylon	240	170	" Sweden	4,563	3,550
British India	179	101	" Belgium	2,031	3,330
Aden & Depend.	181	79	" Argentina	3,694	3,116
Union of S.Africa	34	1	" Netherlands	2,018	2,744
Grand Total	1,830	4,200	Grand Total	71,570	57,451

British dependence upon foreign countries as purchasers of her coal exports is clearly demonstrated in the table given above. Of Empire lands the Irish Free State is the only large importer and the table shows that the smallest purchaser among the principal foreign lands demanded more coal than the new Dominion in 1924. The following abstract indicates how largely the British Dominions satisfy their requirements from local fields. Canada, the largest importer, is also the richest in resources, so that altogether Britain cannot hope to improve her export of coal in the Dominions.

Table 59

Dominion Coal Supplies - Proportion per cent

Dominion	Home Produce		Produce of U.K.		Produce of other lands	
	1913	1924	1913	1924	1913	1924
Canada	42.7	45.1	0.1	1.1	57.2	53.8
Australia	99.9	99.5	0.01	0.4	0.1	0.1
New Zealand	78.3	75.0	-	0.2	21.7	24.8
South Africa	99.2	99.9	0.6	0.01	0.2	0.1
British India	95.2	98.1	1.3	0.5	3.4	1.4

(from Coal Tables 1924)

These percentages indicate that of the Dominions only Canada and New Zealand require to supplement home supplies of coal by considerable imports, and that none of the members of the British Commonwealth named above buys largely from Britain. Coal imports are considered in the short accounts that follow of parts of the Empire. It must be remembered, however, that so long as our exports of coal are purchased by non-British lands, so long as we look to these lands to supply us with return cargoes, and that cries of "Buy Empire Goods" must be moderated by this fact.

A mong the legacies left to Europe by the War were lack of purchasing power and reduced means of industrial production. These are among the reasons for smaller exports to some of the European countries. Other reasons include the higher prices of post-war British coal accompanied by greatly increased rates of haulage to the ports. In such European countries as Italy and Sweden a rapid extension of water-power utilisation has taken place. Imports of coal

into /

into Italy are as large as in 1913, though the share of Britain has diminished, largely, doubtless, owing to receipts of "reparation" coal from Germany.(1) Sweden imports less coal than in 1913, and hydro-electric development may, in course of time, reduce still more seriously her purchases of British coal.(2) France and Germany also are developing their "White Coal", but in these countries hydro-electric supplies are generally distant from the regions of intense manufacture. The French occupation of the Ruhr coalfield led to swelled imports of British coal into Germany in 1923, the total being nearly twice as large as that of 1913. In the Netherlands and Belgium local fields are being rapidly opened up and supplies may tend to reduce imports. In the Argentine cargoes from the United States compete unsuccessfully with British Coal. "That the (Argentine) coal trade has been seriously affected by local production(3) and imports of fuel oil is shown by the decrease in importation."(4)

Hence it may be concluded that the factors likely to affect British exports of coal are the utilisation of new foreign or colonial fields, the increasing use of oil fuel, and the rapid development of water-power schemes.(5) It is unlikely that either together or separately oil and hydro-electric sources of /

(1) Nearly 4 million tons in 1924 (Coal Tables p.51)
(2) "Survey of Overseas Markets" pp.76, 152.
(3) In 1913, 4.6 million imperial gallons; in 1924, 134.5 million. (Coal Tables,1924,p.62)
(4) "Survey of Overseas Markets" p466.
(5) See Tables at end of section.

of power will oust coal from the world's markets, but British coal can maintain its position abroad only so long as it is economical to buy, and as there are available return cargoes in distant markets.(1)

There is still another aspect of British export trade to be considered. Table 56 shows that production of British coal is decreasing. The reasons for this are only partly geographical, for increased difficulty in obtaining coal from old mines is largely offset by the opening of new collieries, and the use of machinery is increasing.(2) During the War large numbers of young miners went on active service, and those who returned were advanced to perform operations in which they were unskilled. Moreover the curtailment of working hours necessarily reduced the yield, and reduction was still further aggravated by the lower output per man employed, apart, probably, from the lack of skill just mentioned. During the war period labour was scarce and partly unskilled; coal was in immediate demand; and much "dead work", necessary for future production of coal but unproductive at the time, remained undone. This left less coal face to be worked on after the War when, too, the roads,/

(1) Return cargoes are not essential in short transits, e.g., vessels carrying coal to Baltic and German North Sea ports may return in water ballast. (Note from Dr Chisholm).

(2) Table 74.60

	Coal Cutting Machines		
	Number	Av. output per machine	Per cent of total output
		tons.	
1909-13	2,227	8,261	6.8
1914-18	3,496	7,437	10.4
1919-23	5,281	6,302	14.4

roads, rails, and wagons underground were in such disrepair as to hinder production which need only keep pace with underground transport.

If home consumption remains about 65 per cent of a decreasing production it is obvious that the quantity available for export will diminish.(1) Even such reduced exports are marketed with difficulty and are in demand only where the price(2) is lower than, or as low as, that of our competitors. "It must not be imagined that Great Britain has obtained her coal export trade in the past because the quality of her coal is superior to any other. With the exception of Welsh anthracite, which has no equal, the British coals, though of a very high standard, can be equalled by other countries.

(1) Coal Consumption in Great Britain Table 61

Purpose for which used	1913 per cent	1923 per cent
Mining and quarrying	6.3	6.1
Miners' coal	2.0	2.4
Railway locomotives	4.8	4.8
Pig iron production	7.4	5.5
Steel production	5.1	6.2
Gas works	6.3	6.2
Electricity Works	1.7	2.6
Domestic	12.2	12.3
Other Trades, etc.	20.5	18.1
Total inland	66.3	64.2
Coastwise bunkers	0.9	0.4
Exports	25.5	28.8
Foreign bunkers	7.3	6.6
	100.0	100.0
Total raised million tons	287.4	276.0

(2) Average F.O.B. export price - 1913, 13s.10d; 1924, 23s.5d. per ton.

The trade was obtained because the price was right." (1) If the price is too high for purchasing markets British exports of manufactured goods must also decline, since coal enters into the cost of all manufactured goods. For such reasons the price of coal must be lowered by greater production, and freights reduced so that the British C.I.F. price will command foreign and colonial markets.

The surplus for export may also be increased by a more economical use of coal in Great Britain. Relatively poor resources of water-power leave the country largely dependent on coal, but much better use could be made of supplies. At present consumption for all operations is carried on, according to authorities, at a loss of efficiency compared with its use in the form of gas or of electricity. Saving would be effected by utilising our coal for the generation of electric energy since low grade coal could be consumed. Cheap power is essential to British industry, and, by the building up of power stations over the country cheap industrial power would be provided for factory, field, and home alike. Such enterprises are economically possible if the electrification of British railways becomes a practical proposition; and on such enterprises the future to British industry appears to depend.

Coal should be treated nowadays as a raw material, and marketed as electricity, as dyes, as chemicals, as iron and steel, and as motor spirit. "It is important to emphasise at /

(1) "The British Coal Industry" by G. Stone p.132.

at once the point that electricity can be supplied from a modern coalfired steam generating station fully as cheaply as from a water-power system,"[1] and coal is the British equivalent of water power. "In Britain, with an annual production of coal more than twice that of Germany, we import a great proportion of the coal dyes, of the chemicals and innumerable semi-products derived from the coal we use, and are incapable of reducing the prices of iron and steel sufficient to keep out German, Belgian and French competition."[2]

(1) "Electrical Power and National Progress," by H. Quigley. p.30.

(2) Ibid. p.32.

~~9.~~

C A N A D A

Summary of Canadian Coal

Table ~~7~~ 62

	1909-13	1919-23
Average Annual - Production	short tons 12,851,804	short tons 15,502,016
Imports	13,451,278	18,569,347
Consumption per head of pop.	3.37	3.66
Exports	1,861,230	2,053,294

	Average Annual Production		Imports 1923 From		Exports 1923	Actual (1) Reserves Million Metric Tons.
	1909-13	1919-23	U.S.A.	U.K.		
	Million short tons		thousand short tons			
Alberta	2.73	6.12	1.1	-	0.6	3,892.8
Nova Scotia	6.97	6.00	79.6	26.4	679.8	2,188.2
British Columbia	2.88	2.79	20.4	-	838.1	23,771.2
Saskatchewan	0.20	0.38	3.9	--	11.5	- (3)
New Brunswick	0.06	0.22	133.4	59.2	115.4	(151.0)
Yukon Terr.	0.01	(2)	included in Brit.Col.			(250.0)
Prince Edward Is.	-	-	5.6	-	-	-
Quebec	-	-	4,534.3	442.6	-	-
Central Ontario	-	-	14,777.3	2.2	0.9	-
Manitoba and Head of Lakes)	-	-	2,601.3	-	8.2	-
Totals	12.85	15.50	22,156.9	530.5	1654.4	29,852.2 (3)

(1) Including seams of 1 foot or over to a depth of 4000 feet Anthracite and bituminous coals only.

(2) 575 tons.

(3) Approximate estimate of Probable Reserve on same basis (note (1)) is 238,503.5 million tons. Figures included in this total for divisions not given under actual Reserve total are shown in brackets.

Canada's coalfields lie mainly on the extreme east or wards the west of the country, and it is from these fields hat the export trade is derived. Most of the export hich /

(4) A new estimate by Prof. Allen gives the reserves of Alberta at 327,663.4 million metric tons (areas to a depth of 1000 ft.; seams over 2 ft. in thickness (Bd. of Trade Journ. Oct 21, 1926).

which is sea-borne is with the corresponding portions of the United States where the supplies are more centrally situated. While in the States population is densest towards the east coast, in Canada the most densely populated area is the Lake Peninsula. This area is without local supplies of coal but is conveniently reached by the Great Lakes from United States fields. Thus the United States have a practical monopoly of Canada's coal imports, British supplies(4) scarcely penetrating beyond the eastern coastal provinces (Table 62). Of the American imports duty-free anthracite for domestic heating stoves accounts for between 20 and 30 per cent(5), the remainder being principally bituminous coals, subject to duty, for industrial purposes.

In Alberta, which now ranks first among producing provinces, the actual reserves of coal cover an area of 25.300 sq.miles, and by themselves could supply domestic demands (about 35 million tons per annum) for "an unthinkably long period." This coal, found in three distinct horizons of the Cretaceous geological system, is of most value where it has been subjected to greatest pressure near the base of the Rockies. Anthracite occurs in the Cascade basin; in most of the area the coal is mainly bituminous. Other fields are worked from the east of Crowsnest Pass at Coleman, Blairmore /

(4) In 1923 Britain supplied 2.3 per cent of total quantity imported.
(5) 22.2 per cent in 1923.

~~11.~~

Blairmore-Frank and Livingstone, north to the Bighorn Basin.

Coals of the Edmonton formation occur from the international boundary almost to the Lesser Slave Lake. Most of these are lignitic, but towards the west become bituminous. Much lignite is mined round Edmonton itself.

Between the international boundary and the Red Deer river lie the coal beds of the Belly River horizon. Lignite of good quality is largely mined at Lethbridge and Taber.

In British Columbia the coals vary from bituminous in the interior to anthracitic in the islands. The principal mining areas are the Crowsnest Pass where Fernie is a centre for supplying the smelting industries of the Kootenays; the Nicola Valley, about half-way between Okanagan Lake and the Fraser river, which serves the central part of the province; and Vancouver Island, with centres at Nanaimo, Comox, and Suquash in the east of the island, which serves the state of California, U.S.A. Other supplies are obtained from Graham Island (Queen Charlotte Islands), the Telkwa Valley at the eastern base of the Bulkley Mountains in the Skeena basin, and along the upper Skeena at Mount Groundhog, where anthracite is mined.

On the east coast of Canada coal is mined in the Sydney and Inverness fields of Cape Breton Island and in the Pictou and Cumberland fields of the mainland of Nova Scotia. The main seam in the Stellarton area (Pictou) has a thickness of 40 feet. These eastern coals belong to the Carboniferous /

Carboniferous period while in British Columbia the coal-yielding Rocks are Cretaceous and Tertiary.

A U S T R A L I A

Australian Coal — Table 63

State	Production - 1000 tons 1909-13	1919-23
New South Wales	8,837	10,160
Queensland	892	1,003
Victoria	470	483
Western Australia	267	438
Tasmania	63	72
TOTAL	10,529	12,156

Of the total value of minerals produced in Australia to the end of 1923 coal accounted for 15 per cent, and occupied the second place to gold (58 per cent). But while the value of the gold extracted has steadily decreased since the beginning of the century that of coal has increased and in 1923 represented over 47 per cent of the value of minerals produced, and gold (less than 15 per cent) has fallen to the second place.

New South Wales is by far the most productive state, yielding over 80 per cent of Australia's output. Most of this coal is of good quality suitable for gas, household and steaming purposes. It is mined over a Permo-Carboniferous area some 16,550 square miles in extent the seams of which outcrop near Newcastle, Bulli, and Lithgow from a basin which is deepest in the vicinity of Sydney where the Sydney Harbour Colliery is worked at a depth of 2,884 feet, - the deepest/

deepest mine in Australia. From the Northern(Newcastle) coalfield gas and household coal are obtained whilethe Southern (Illawara) and Western (Lithgow) fields yield steam coal. The most productive district lies between West Maitland and Cessnock in the Northern coalfield which yields 70 per cent of the output of the State. Thus Newcastle is the principal centre of coal export.

Triassic or Trias-Jura deposits in the Clarence valley yield a coal of inferior quality suitable only for local use., but the extension of the seams into Queensland is mined at Ipswich where the quality is much higher and well adapted for coke-making. While the coal resources of Queensland are stated to be of vast extent and are widely distributed further examination is necessary to determine their quality, and railway facilities are indispensable for their exploitation.

At present the chief areas of production are in the south round Ipswich and in the Darling Downs (Dalby); in the Maryborough district; in the Rockhampton hinderland (including the rich region round Clermont); the state mine at Bowen (since 1919); and the Mount Mulligan field (Chillagoe).

In Victoria fields of coal are worked in Southern Gippsland. Great deposits of brown coal and lignite reach a thickness of over 800 feet in the Latrobe valley. A comprehensive scheme of electrical power generation and transmission has been undertaken in connection with these deposits at Morwell, the

power /

power being carried to Melbourne and other towns within economic distance. Over 115,000 tons of brown coal were raised from the State Mine at Morwell in 1923.

At present the only coalfield worked in Western Australia is that in the Permo-Carboniferous beds round Collie where over 420,000 tons of hydrous bituminous and lignitic coal were produced in 1923. Other deposits are known, but geological examination of the state is far from complete.

Tasmanian coal supplies are derived principally from the highlands in the north-east of the island. In South Australia proved deposits (e.g. at Robe) either occur too deep or lie too far from the railways, for exploitation. Apparently most of it is of lignitic quality.

Imports of foreign coal are small, averaging less than 35,000 tons per annum. Exports of Australian coal (about 5 million tons inclusive of bunker coal each year) find their markets mainly around the Pacific shores in New Zealand, the Philippine Islands, San Francisco and Chile, but India, Farther India and the Dutch East Indies also import supplies. Australian home consumption is about 10 million tons.

NEW ZEALAND

Summary of New Zealand Coal

Table 7864.

Period	Average Annual Output	Average Annual Import	Average Annual Export
	1000 tons	1000 tons	1000 tons
1909-13	2,048	340 (1)	224 (1)
1914-18	2,160	342	
1919-23	1,866	527	103

(1) Average 1911-13.

New Zealand consumes annually about 2,500,000 tons of coal, and as the table shows, increasing imports are necessary. It must be noted that the figures of output in the table include brown coal and lignite which comprise over 50 per cent of the total production. The bulk of the imports comes from Australia.

Of the bituminous and semi-bituminous coal raised over 90 per cent is produced in the West Coast district of the South Island where Westport and Greymouth are the principal outlets. Bituminous coals of excellent steaming quality from the field between the Buller and Mokihinui rivers are in request by the Admiralty for naval stations in the Southern Hemisphere. In the North Island bituminous coal is mined in North Auckland, Waikato, and North Taranaki; but the production of brown coal in these areas is about five times as great. Brown coal and lignite predominate in other parts of the South Island especially in Otago and Southland.

According /

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According to the New Zealand Year Book the proved resources of coal are only 610 million tons of which bituminous coals total only 187 million tons.

UNION OF SOUTH AFRICA

"South Africa has made its name through the production of gold and diamonds, but it is mainly due to the existence of cheap coal that the large output of gold and diamonds has been made possible."(1) The existence of extensive coalfields is of economic importance not only to South Africa where timber for fuel as well as for other purposes is scarce, steamers are willing to pay well for bunker supplies, and industries are increasing rapidly, but to Africa generally. Demand tends to increase because supplies are relatively cheap, and the cost of native labour in the mines is not likely to rise to the level of European. Within the Union consumption is greatest at the mines, on the railways, and among the vessels which coal at such ports as Durban.

The present production - less than 12 million tons per annum - is insignificant compared with the total resources, but as the fields have not yet been geologically surveyed, no accurate estimate of coal resources is possible. In the accompanying table the share of each province is shown as a percentage of the total output.

(1) Official Year Book of the Union of South Africa, No.1.p.429.

Table ~~79~~ 65

Output of Coal(per cent of total output and average price per ton).

	Cape of Good Hope	Natal	Trans-vaal	Orange Free State	Average Price at Pit's mouth per ton ① Cape	Natal	Trans.	O.F.S.	Average Price per ton United Kingdom
					s.d.	s.d. ②	s.d. ②	s.d. ②	s.d.
13	1.0 C.	34.0	58.0	7.0	11.4	5.6	4.6	5.6	8.9
18	0.5	28.5	63.0	8.0	12.10	8.4	4.8	5.4	—
23	0.05	32.1	60.0	7.9	15.4	10.10	5.9	5.9	24.11

① ton of 2000 lbs. ② average 1911 and 1912-only.

Indwe and Molteno supply the small quantity of Cape Province Coal. It is used for purely local purposes, and since it cannot compete with the higher grade coals now available from the remainder of the Union, its production is rapidly decreasing.

In Natal coal is produced from collieries in Vryheid, Newcastle, Utrecht and Klip River districts; it is of excellent quality. Much coal exists in Zululand but as yet little prospecting has been carried out. Durban, the outlet for the coal traffic, and an important bunkering port, controlled about 66 per cent of the total coal trade in 1923.①

Transvaal coal is mined at present only in the High Veld of the south east of the province. An extension of this field supplies most of the Orange Free State coal near Vereeniging. Other Transvaal fields not yet worked are located about 30 miles north of Pretoria; along the Swaziland and Mozambique border (the Lebombo area); in the Limpopo valley; and in the North Waterberg area, an extension of the Limpopo fields.

(1) Cape Town 19 per cent; Lourenco Marques 15 per cent.

~~13~~.

I N D I A

In ~~British~~ India the British provinces of Bihar and Orissa, Bengal, and the Central Provinces, with the native state of Hyderabad, yielded over 95 per cent of the coal output of 1923. The Gondwana coalfields of the two greatest producing provinces are worked most largely in Bihar and Orissa where some 580 coal mines yielded 66.6 per cent of India's total output. The Jharia coalfield accounted for 10 million tons out of 13 millions from the State, and was followed by production from extensions of the Bengal Raniganj field and at Giridih. Other mines are worked in the centre of Bihar, ~~xxxxxxxxxxx~~ principally at Bokaro in Hazaribagh, to supply the railway companies, which took over a million tons. Other fields will be opened up when railway facilities, efficient and steady labour, and markets are available. As in Britain working hours have been reduced,(1) and the output per person employed(2) below ground has decreased, while irregularity of attendance, due partly to frequent visits to their agricultural holdings, partly to excess of earnings over cost of living, makes the supply of labour fluctuate. Modern mechanical appliances, including electric power and haulage, are now being introduced and increased production should result.

Over 4 million tons are raised annually in Bengal where over 280 mines are worked principally in the neighbourhood of Raniganj. In Hyderabad the Singareni mines are important while /

(1) Rarely over 50 hours per week in 1924.
(2) In 1922 179 tons.

while there is also considerable production in the Central Provinces. Assam's output in 1923 was 326,149 tons or 1.5 per cent of the total Indian output.

Imports (about a million tons) and exports (less than 150,000 tons) are both small; a Coal Committee has been appointed to stimulate the export trade from Calcutta by pooling and grading Indian coal, which is of rather poor quality, for export and for bunkering. In consequence of the high freight rates from Calcutta (3) Bombay is now supplied mainly from Durban or Cardiff.(4)

(3) In 1922 freights were Rs.10 to Rs.11 per ton; in pre-war years Rs.4 to Rs.5.

(4) In 1922 freights were roughly the same as in the pre-war period 21 - 22 s. per ton.

OTHER EMPIRE COALFIELDS.

The Government Collieries of Nigeria consist of two separate groups of mines at Udi in Enugu district about 150 miles North of Port Harcourt. This sub-bituminous coal is used exclusively by the Nigerian Railway with very good results. Production reached 175,137 tons in 1923-24, and with the completion of the railway to Bukuru, supplies will be available for the tin mines of the Bauchi ~~xxxxxx~~ plateau.(1) In this case production will increase, and the estimated annual capacity of the mines (300,000 tons) be tested. Existing facilities at Port Harcourt allow loading on board ship at a rate of 1000 tons per day from the coal tip.

(1) See Map (fig. ~~32~~ 25) p. ~~202~~ 138.

Table 66

Water Power - Developed and Available, 1924.(1)

	Millions of Horsepower	
	Developed	Available
Empire Lands -		
Great Britain	0.25	0.9
Canada	3.28	23.0
India	0.20	27.0
New Zealand	0.05	2.5
Empire Total	4.23	58.9
Foreign Lands -		
United States	9.8	28.0
Sweden	1.42	8.8
Japan	1.5	6.4
Italy	2.5	5.4
France	2.5	4.7
Germany	0.75	1.5
World Total	27.0	200.0

(1) chiefly from Ency. Brit. New Vols. III. p.400

Table 67.

Production of Petroleum(1)

	Production of Crude Petroleum		
	Million Imperial Gallons		
	1913	1923	1924
Empire Lands -			
British India	277	294	285
Sarawak	5	138	157
Trinidad	22	107	150
Canada	8	6	5
Foreign Lands -			
United States	8,692	25,389	24,980
Mexico	899	5,235	4,876
Russia(2)	2,323	1,309	1,581
Persia	65	1,008	1,115

(1) Coal Tables 1924. pp. 61, 62.
(2) Production of raw naphtha.